DSP DESIGN

Tapton Park Innovation Centre
Brimington Road
Chesterfield S41 0TZ
Phone: +44 (0) 1246 545910
Fax: +44 (0) 1246 545911
Email: info@dspdesign.com
http://www.dspdesign.com

TCDEVPLUS

EMBEDDED PC DEVELOPMENT SYSTEM

TECHNICAL REFERENCE MANUAL

Revision C00 **23 January 2001**

TRM-TCDEVPLUS 186211.C00 CGP

All information in this manual is believed to be accurate and reliable. However, no responsibility is assumed by DSP Design Limited for its use. Since conditions of product use are outside our control, we make no warranties express or implied in relation thereto. We therefore cannot accept any liability in connection with any use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

Whilst every effort has been made to ensure that this document is correct, errors can occur. If you find any errors or omissions please let us know, so that we can put this right.

DSP Design Limited
Tapton Park Innovation Centre
Brimington Road
Chesterfield S41 0TZ
United Kingdom

Tel +44 (0) 1246 545 910
Fax +44 (0) 1246 545 911
Email sales@dspdesign.com
Web: www.dspdesign.com

(This page is intentionally left blank).

CONTENTS

TABLES

FIGURES

REVISION HISTORY

A00 This is the first revision of the TCDEVPLUS Technical Reference Manual.

B00 Corrected documentation of the TCDEVAD program. Corrected some typos. Provided updated information on getting started with TP300 and TP400. Added warnings relating to use with TC386 and TC486.

C00 Modified to reflect the changes on the REV C PCB. This manual applies to both REV B and REV C PCBs. A new section 3.10 (Using ISA and PCI bus boards) is added, as is a new Appendix G (Differences between REV B and REV C).

1 INTRODUCTION

1.1 OVERVIEW

The TCDEVPLUS is a full feature development platform for use with DSP Design's PC/104 and GCAT486 embedded PC compatible computers. It replaces an earlier Development System, the TCDEV. The TCDEVPLUS provides many enhancements over the TCDEV, and better supports our newer processor boards.

The TCDEVPLUS board has been designed to make it easy for you to develop PC/104 and GCAT486 based systems. Its primary purpose is to allow you to connect standard PC peripherals to the embedded computer boards, saving you the time and expense of constructing the necessary cables. There are standard PC connectors for serial and printer ports, keyboard and mouse, VGA graphics, USB and Ethernet ports, to name but a few. The TCDEVPLUS has no less than 41 connectors, which shows we have done our utmost to simplify your connectivity tasks.

The TCDEVPLUS also provides many additional features, which speeds the process of developing an embedded PC system.

The TCDEVPLUS Development System provides sites for you to plug in PC/104 processor and I/O cards, GCAT486 processor and I/O cards, as well as ISA bus and PCI bus cards. These cards can be mixed, within reason. As an example, you are able to use a PC/104-Plus processor card with a PCI bus frame grabber or LAN card, or a GCAT486 processor with a PC/104 opto-isolator board.

As well as connectors there is considerable active electronics on the TCDEVPLUS. There are four peripheral subsystems: a VGA graphics controller, floppy and IDE disk interfaces, and a COM4 serial port. Each of these subsystems can be of use during the development process, and each can be individually enabled or disabled allowing you to choose between using a TCDEVPLUS subsystem or the same functionality provided by a different PC or GCAT module, or ISA or PCI bus expansion card.

TCDEVPLUS Development System also includes a built-in floppy disk drive, an LED status port, power supply monitoring circuitry, a BIOS EPROM socket, power supply circuits, clock generators, a battery backup circuit and other circuits which are useful for the development process.

Note that there are two versions of the TCDEVPLUS in the field – the REV B and the REV C PCBs. This manual covers both versions. The two versions can be distinguished by the text near the serial number patch: REV B boards include the number 186201.B00 and REV C boards have the text 186201.C00. Also, and more easily, the battery on the REV B board is near the EPROM socket and on the REV C board is near the power supply connector. Appendix G describes the differences between the two versions.

1.2 TCDEVPLUS FEATURES

- CRT VGA graphics controller and standard 15 pin socket to optionally provide VGA graphics in your development environment.
- Floppy disk controller and 3.5" floppy disk drive to provide a quick route to boot an operating system, and to transfer software onto your embedded processor.
- IDE controller to allow you to add both 2.5" and 3.5" IDE disk drives to your development system. A 2.5" IDE drive may be mounted on the TCDEVPLUS.
- A Compact Flash socket allows a Compact Flash card to be used as a solid-state ATA disk drive.
- A small speaker is fitted.
- NiMH battery and charge circuit to back-up processor card CMOS SRAM and real-time clocks.
- Reset button.
- A full-length ISA bus (PC/AT) socket and a PCI socket, which gives you access to a wide range of standard PC peripherals.
- Two PC/104 bus connectors. A male connector set and a female connector set allow you to mount PC/104 bus cards either way up, thus allowing access to both sides of PC/104 bus cards, to probe cards with oscilloscopes etc.
- One of the PC/104 bus sites includes a 120-way PC/104-Plus connector, thus supporting the PCI bus extension to the PC/104 specification.
- PC compatible connectors to allow you to interface DSP Design processor boards with standard PC peripherals. These include:
  - Four 9-way D-type connectors for serial ports COM1 – COM4.
  - A 25-way D-type connector for a printer port.
  - Two 6-pin mini-DIN connectors for a PS/2 keyboard and mouse.
  - Two USB connectors.
  - RJ-45 Ethernet connector, with isolation transformer.
  - Connectors for 2.5", 3.5" and Compact Flash card ATA/IDE disk controllers.
- LED diagnostic port, allowing LEDs to capture writes to the POST port 80h.
- The LED diagnostic port can also be programmed to capture accesses to other I/O addresses.
- EPROM socket for BIOS, with selectable address decoding.
- Mechanisms to allow the re-programming of the Flash memory on embedded PC boards.
- Circuitry to allow the measurement of PC/104 and GCAT486 power supply current.

1.3 GETTING STARTED QUICKLY

This section gives all the information required to start quickly. It assumes that the TCDEVPLUS is being used with a DSP Design PC/104 or GCAT486 processor board and that no other boards are being used. If you want to install additional boards we suggest that you follow these instructions to get your system running before you add them.

You should also check with the Technical Reference Manual for your processor board for any additional "Getting Started" instructions. Note that the Technical Reference Manual may be for the earlier TCDEV Development System, but jumper names are the same, and instructions for the TCDEV should still apply to the TCDEVPLUS.

Check that the jumper areas E3, E4 and E5 have their jumpers installed in the EN position (default configuration). This ensures that the TCDEVPLUS floppy, IDE and VGA graphics controllers are enabled. (Although many of DSP Design's processor boards have their own floppy and IDE disk controllers and display sub-systems, we recommend you begin by using the TCDEVPLUS peripherals, and move across to the processor board's peripherals during the development process).

TP300 and TP400 users will have to set jumper E4 to the DIS (disable) setting, or enter the BIOS setup program and disable the TP300/TP400 internal IDE and floppy disk controllers. This is because, by default, the TP300 and TP400 have their internal IDE and floppy disk controllers enabled.

Check that jumper area E6 has one jumper (at the position marked "C000") fitted in the "EN" position and all other jumpers in the "DIS" position (default configuration). This ensures that the TCDEVPLUS VGA BIOS will appear on the ISA bus at address C0000h, which is the correct address for VGA operation.

Check that the E7 jumpers are both in the 1 – 2 position; this will cause the BIOS POST codes to be displayed on the eight LEDs.

The E2 battery jumper must be in position. One setting connects the 3.3V power supply to the processor's BATT battery pin, and the other setting connects the on-board NiMH battery. Do not leave this jumper unconnected, as some processors do not boot properly with a floating battery pin.

Plug in a PC/104 processor or a GCAT486 processor. You must not attempt to plug in more than one processor at once.

If you are using a GCAT486 processor then plug it onto the TCDEVPLUS at connector J37 and J39. Ensure that the GCAT486 is firmly pushed down.

If you are using a PC/104 processor card, plug it into the TCDEVPLUS PC/104 connectors. Connect the processor module 50-way I/O connector to the TCDEVPLUS J4 connector using the 50-way cable assembly provided. Ensure that the pin 1 end of the 50 way cable assembly connects to pin 1 of the TCDEVPLUS J4 connector and to pin 1 of the J3 connector on the processor module. Failure to connect the J4 cable assembly correctly may result in irreversible product damage or failure.

If you are using a processor board which has a 10-way or 14-way connector next to this 50-way connector, then connect this processor module I/O connector to the TCDEVPLUS J5 connector using the 14-way cable assembly provided. If the processor board has a 14-way connector then ensure that the pin 1 end of the 14 way cable assembly connects to pin 1 of the TCDEVPLUS J5 connector and to pin 1 of the connector on the processor module. If the processor board has a 10-way connector then the 14-way cable is plugged onto the processor board using the 10 central pins on the 14-way socket. That is, ensure that there are two unused pins at either end of the 14-way socket. Pin 1 of the processor connector goes to pin 3 of the ribbon cable. **Failure to connect the I/O cable assemblies correctly may damage the equipment.**

Connect but do not switch on a power supply. DSP Design sells a mains power supply for use with the TCDEVPLUS, called the TPPSU. The 45W TPPSU can be plugged into the J24 connector on the TCDEVPLUS. (Note that the TCPSU and

TPPSU power connectors are polarized. Ensure that the locking tab on the power supply cable mates with the locking tab on the TCDEVPLUS connector). The TCPSU has an earth wire which must be connected to an adjacent earth spade terminal. **Failure to connect the power supply cable assembly correctly may damage the equipment.**

The TCDEVPLUS can alternatively be powered by an AT motherboard power supply from a PC computer (though not an ATX power supply). You may plug one of the disk drive power cables into TCDEVPLUS connector J23. Using this type of power supply can be useful if you also need to provide power to 3.5" IDE drives and CDROM drives. **Do not attempt to use a PC power supply and a TCPSU or TPPSU at the same time.**

Connect a keyboard to the J16 connector. If you are using the GCAT486 the keyboard should be set to XT mode, and an adapter may be required to allow a 5-pin DIN connector to plug into the 6-pin mini-DIN on the TCDEVPLUS.

Connect a VGA monitor to the J11 connector.

Insert a bootable disk into the floppy disk drive and switch the power supply on. The power LED on the TCDEVPLUS will illuminate to confirm that the power supply is on. The BIOS will light the LEDs on the port 80h status port and display a sign-on message on the VGA monitor. The operating system will boot from the floppy disk.

Remember: **TP300 and TP400 users will have to set jumper E4 to the DIS (disable) setting, or enter the BIOS setup program and disable the TP300/TP400 internal IDE and floppy disk controllers. This is because, by default, the TP300 and TP400 have their internal IDE and floppy disk controllers enabled.**

Now refer to this manual and to the Technical Reference Manual for your processor board for further information.

Potential problems can arise when using the old TC386 and TC486 processor boards with the TCDEVPLUS. Users should refer to Appendix B (description of jumper E10) before using these boards.

Potential problems can arise when plugging in PCI bus boards. Users should refer to section 3.10 before using these boards.

2 PERIPHERALS

There are four peripherals which are included on the TCDEVPLUS. These are a floppy disk controller, an IDE disk controller, a VGA controller and a COM4 serial port. Each of these can be individually enabled or disabled. The peripherals can be used by both PC/104 processors and the GCAT486 processor.

Although many of DSP Design's processor boards contain these peripherals, it can often be useful to make use of the peripherals on the TCDEVPLUS, particularly at the start of a development process, since they are connected to standard PC connectors. As the development process proceeds you will probably want to disable the peripherals, perhaps making use of the equivalent peripheral on the processor board.

2.1 FLOPPY DISK DRIVE

The inclusion of a floppy disk drive is an essential part of most development systems. We have included a floppy disk drive controller and floppy disk drive on the TCDEVPLUS. The 3.5" floppy disk drive is bolted to the underside of the TCDEVPLUS PCB. It connects to the J40 connector on the TCDEVPLUS via a short cable assembly and, in turn, to the PC compatible floppy controller chip.

Although many of DSP Design's processor boards include a built-in floppy disk controller, some do not. Even for those which do, it can be convenient to make use of the floppy drive provided pre-wired on the TCDEVPLUS. The floppy disk drive can also be used with the GCAT486 processor board.

The floppy disk controller on the TCDEVPLUS can be enabled or disabled by changing the jumper selection at E5. The 'EN' position enables the floppy controller and 'DIS' disables it. The TCDEVPLUS floppy controller should be disabled when using the floppy disk controller on a PC/104 bus processor board. Similarly, the floppy disk controller within a PC/104 board (if it exists) should be disabled when using the TCDEVPLUS floppy disk controller. This is done in the processor card's BIOS setup program.

The floppy disk controller contains a number of internal registers for interfacing between the microprocessor and the floppy disk drive. These are mapped into the I/O address space at 3F0h – 3F7h. Interrupt IRQ6 and DMA channel 2 are used by the floppy disk controller.

2.2 IDE DRIVE

For faster disk operation and larger storage capacity an IDE drive can be added. The TCDEVPLUS includes an IDE controller and will interface directly with 2.5" and 3.5" IDE drives. A Compact Flash card can also be used as an IDE drive.

The IDE controller is enabled or disabled at jumper area E4. The 'EN' position enables the controller and 'DIS' disables it. The TCDEVPLUS IDE controller should be disabled when using the IDE disk controller on a PC/104 bus processor board. Similarly, the IDE disk controller within a PC/104 board (if it exists) should be disabled when using the TCDEVPLUS IDE disk controller. This is done in the processor card's BIOS setup program.

TP300 and TP400 users will have to set jumper E4 to the DIS (disable) setting, or enter the BIOS setup program and disable the TP300/TP400 internal IDE and floppy disk controllers. This is because, by default, the TP300 and TP400 have their internal IDE and floppy disk controllers enabled.

The 2.5" IDE drives use a 2mm pitch 44-pin connector. This connector includes the power supply pins (+5V and GND) so a separate power cable is not needed. The 3.5" IDE drives use a 0.1" pitch 40-pin connector. This connector does not include the power supply pins (+12V, +5V and GND) so a separate power cable is needed. You may make up a cable to power your 3.5" drives from J23, or supply both the drives and the TCDEVPLUS from a PC power supply.

Although many of DSP Design's processor boards include a built-in IDE disk controller, some do not. Even for those which do, it can be convenient to make use of the IDE connectors provided on the TCDEVPLUS. The IDE disk drive can also be used with the GCAT486 processor board.

Both a 44-way 2mm connector and 40-way 0.1" connector are provided on the TCDEVPLUS. This allows a mix of 2.5" and 3.5" drives to be used, if required. A typical application would involve a 2.5" IDE drive, configured as the master, connected to the 44-way 2mm connector and a CDROM drive, configured as the slave, connected to the 40-way 0.1" connector.

In fact, two 44-way 2mm connectors are provided – the second is soldered to the underside of the TCDEVPLUS PCB, where it can be used to connect to a 2.5" IDE drive which can be screwed onto the underside of the TCDEVPLUS.

It is possible to make use of the IDE connectors and Compact Flash socket even when using the IDE disk controller on your PC/104 processor board. You can connect a 44-way 2mm cable from the IDE connector on the processor board to J27 on the TCDEVPLUS, and then access IDE drives and Compact Flash cards on the other TCDEVPLUS IDE connectors.

There is an additional note on this: to do this successfully with the TP300 and TP400 processors the /IOCS16 signal on the IDE connectors must be disconnected from the /IOCS16 signal on the PC/104 bus. Jumper E12 is used to do this on REV C versions of the TCDEVPLUS. Users of REV B PCBs must cut pin 32 of the cables (both between the TP300/TP400 and the TCDEVPLUS, and between the TCDEVPLUS and the IDE drives). The /IOCS16 must be disconnected ONLY if you are linking between the TP300/TP400 and the TCDEVPLUS.

The IDE interface contains a number of registers for interfacing between the microprocessor and the IDE disk drive. These are mapped into the processor I/O space at addresses 1F0h - 1F7h. Interrupt IRQ14 is used by IDE drives. (In fact, the I/O registers are not within the IDE disk controller logic on the TCDEVPLUS, but rather within the disk drives themselves. The circuitry on the TCDEVPLUS provides address decoding logic and other support circuitry.)

Compact Flash cards can also be used as IDE disk drives. From a software perspective they are indistinguishable from mechanical drives. They typically range in size from a few megabytes to a few hundreds of megabytes. Capacities are increasing, and large capacity mechanical drives are also available in the Compact Flash format. The Compact Flash socket can be configured as a master or slave with the solder link LK5 on the TCDEVPLUS PCB.

Compact Flash cards are a useful alternative to IDE drives and floppy disks during development. They are reasonably high capacity, and if you equip your PC with the CFREADER product you are able to transfer files between your development machine and the TCDEVPLUS. The CFREADER is a Compact Flash reader/writer unit that plugs into the printer port of a PC.

2.3 VGA CRT GRAPHICS

A VGA graphics controller is included on the TCDEVPLUS. The VGA signals connect to a standard 15 pin high density D-type VGA connector. You can use mono or colour VGA monitors and any graphics mode up to 640 x 480 or 600 x 800 resolution with up to 256 colours, or 1024 x 768 resolution with 16 colours. These resolutions are relatively limited, but useful enough for development work.

Although many of DSP Design's processor boards include a built-in VGA controller, some do not. Even for those which do, it can be convenient to make use of the VGA controller and connector provided on the TCDEVPLUS. The VGA controller can also be used with the GCAT486 processor board.

The VGA controller is enabled or disabled by changing the jumper selection at E3. The 'EN' position enables the controller and 'DIS' disables it. The TCDEVPLUS VGA controller should be disabled when using the VGA controller on a PC/104 bus processor board. In addition, the TCDEVPLUS VGA controller requires a VGA BIOS. This is programmed into the EPROM fitted to the TCDEVPLUS. The VGA BIOS must be enabled using jumper area E6. When VGA graphics is enabled on the TCDEVPLUS, the 'C000' position at E6 should be in the 'EN' position. When disabling VGA graphics the 'C000' jumper area at E6 must be in the 'DIS' position. Doing this removes the TCDEVPLUS VGA BIOS from address C0000h on the PC/104 bus.

Thus there are two jumpers which must be correctly set if the VGA controller is to be enabled or disabled – E3 and E6.

When using processor boards with in-built graphics, the BIOS first looks to see if it can find external VGA graphics adapter. This can be the VGA controller on the TCDEVPLUS, if it is enabled, or VGA display controllers plugged into the ISA bus or PCI bus sockets. If the processor board BIOS locates an external VGA controller then the processor's display controller is disabled and the external VGA controller is used instead.

2.4 COM4 SERIAL PORT

A COM4 serial port is provided on the TCDEVPLUS. This was added primarily for DSP Design's in-house BIOS development work. When debugging a BIOS a serial port is often used, to connect a debugger running on a desktop PC. Even if the PC has serial ports, these are often unavailable until they are initialized by BIOS software. This poses a bootstrap problem when debugging the BIOS, and for this reason we have added a COM4 serial port which can be turned on or off purely by hardware.

The COM4 serial port on the TCDEVPLUS can be enabled or disabled by changing the jumper selection at E8. The 'EN' position enables COM4 and 'DIS' disables it. If you are using a processor board that already has COM4, then it should be disabled if you are using the TCDEVPLUS COM4. This can be done in the processor card's Setup program.

COM4 serial port contains a number of internal registers. These are mapped into the I/O address space at 2E8h – 2EFh. No interrupt is connected to COM4, though the interrupt pin is available at test point TP8, so it could be connected to an ISA bus IRQ pin with a wire link if necessary.

2.5 I/O ADDRESS MAP

The on-board peripherals occupy I/O addresses, which are listed in Table 1. There is one other I/O address: 8022h is the address used to program the programmable address decode within the LED status port sub-system.

ADDRESS	DESCRIPTION
1F0h – 1F7h	IDE Port (if enabled)
2E0h – 2EFh	COM4 (if enabled)
3F0h – 3F7h	Floppy Disk (if enabled)
8022h	LED Status Port: Programmable Address

TABLE 1 - I/O ADDRESS MAP

3 SUPPORT CIRCUITRY

As well as the peripherals described in Section 2, the TCDEVPLUS contains other circuitry which supports the processor boards during the development process. These are described here.

3.1 EPROM SOCKET

The TCDEVPLUS has a single 32-pin EPROM socket capable of accepting 128k byte or 256k byte EPROMs. This socket is used for BIOS EPROMs. Normally the processor cards contain their own BIOS, usually in Flash memory. But under some circumstances it is necessary for the processors to use a BIOS in the EPROM.

By default the EPROM socket contains a 256k byte EPROM. The bottom 32k byte contains the TCDEVPLUS VGA BIOS. The top 128k of the EPROM contains a TB486 system BIOS (since the TB486 is at this time our most popular processor).

The system BIOS is provided to allow a processor to boot when its own BIOS has been corrupted. This is described in depth in Appendix F.

The EPROM socket is mapped onto the PC/104 bus in the address range C0000h to FFFFFh. This 256k byte range is divided into eight 32k-byte chunks, which can be individually enabled or disabled. Jumper area E6 allows each 32k-byte chunk of the EPROM to be enabled or disabled.

Usually all of the EPROM is disabled, or else the VGA BIOS only is enabled – this is the bottom 32k bytes, starting at address C0000h. The VGA BIOS must be enabled if the TCDEVPLUS on-board VGA controller is used. In this case the E6 jumper marked "C000" should be set in the EN (enabled) position, and all the other jumpers should be set to the DIS (disabled) position.

In some circumstances it may be appropriate disable the BIOS on the processor board, and to boot from a BIOS image contained in the EPROM instead. This is appropriate during DSP Design's manufacturing process, when the Flash memory on the processor board does not yet contain a BIOS, and when the BIOS has been accidentally erased from the Flash memory. Appendix F contains information on reprogramming the BIOS on processor cards.

When it is necessary to boot a processor from a BIOS in the EPROM, the Flash memory on the processor board must be disabled. This is explained in the processor board Technical Reference Manual. Then the BIOS in the EPROM must be enabled by jumpers at E6. The size of the BIOS varies from board to board. BIOSes may be 64k, 128k or 256k bytes in size. In each case the appropriate portion of the EPROM must be enabled at E6.

For example, to enable a 128k byte BIOS in EPROM the jumpers marked "F800", "F000", "E800" and "E000" must be set to the EN position. The VGA BIOS might also need to be enabled, with the "C000" jumper. To enable a 256k byte image all eight jumpers must be set to EN.

Table 2 shows how the EPROM maps onto the PC/104 bus address space and how this corresponds to jumper area E6.

PCB MARKING	MEMORY RANGE	SEGMENT:OFFSET OF STARTING ADDR.	OFFSET FROM START OF 128K BYTE EPROM	OFFSET FROM START OF 256K BYTE EPROM
F800	F8000h – FFFFFh	F800:0	18000h	38000h
F000	F0000h – F7FFFh	F000:0	10000h	30000h
E800	E8000h – EFFFFh	E800:0	8000h	28000h
E000	E0000h – E7FFFh	E000:0	0	20000h
D800	D8000h – DFFFFh	D800:0	-	18000h
D000	D0000h – D7FFFh	D000:0	-	10000h
C800	C8000h – CFFFFh	C800:0	-	8000h
C000	C0000h – C7FFFh	C000:0	-	0

TABLE 2 - JUMPER AREA E6

3.2 DIAGNOSTIC LED DISPLAY PORT

A group of eight LEDs are provided as a status port. The LEDs are driven by a latch which is able to capture a byte from the data bus. Thus the LEDs represent the most recent value seen on the ISA bus at a particular address, rendered as a binary number.

Usually the status LEDs capture data written to I/O port 80h. This port is typically used by the power-on self-test (POST) code within the BIOS. As the computer boots the BIOS writes codes to port 80h to indicate the POST point that it has reached. Should an irrecoverable error be detected the POST code indicated on the LEDs can be used to establish the point at which the BIOS halted. This in turn can help with the diagnosis of the problem.

The address decoding logic which latches the data bus in the LED latch is contained within a programmable logic device. DSP Design have provided additional logic within this device to allow other ISA bus activity to be captured on the LEDs. Jumper area E7 consists of two links, which can be set to four different states, specifying different address decoding functions. This is described in Table 3. As can be seen, another option is to capture writes to the printer port. A much more powerful option is a programmable address decode, which is described next.

E7 SETTING		ADDRESS DECODED	DESCRIPTION
E7A	E7B		
1 – 2	1 – 2	Writes to 80h	Writes to POST diagnostic port.
1 – 2	2 – 3	Writes to 378h	Writes to LPT1: printer port
2 – 3	1 – 2	RFU	Reserved for future use.
2 – 3	2 – 3	Prog. Port	Reads or writes from a programmable address.

TABLE 3 - STATUS LED ADDRESS SELECTION

The programmable address decoder option allows the LEDs to capture accesses (reads or writes or both) to any I/O address. Furthermore, the address decoder can be programmed to ignore any of address bits A0, A1, A2 or A3, and can also be programmed to ignore the AEN signal. This feature is used to force the address decoder to decode a range of addresses, from one to 16 bytes.

The address decoder is programmed by shifting the address and control information into a shift register contained in the programmable logic device, one bit at a time. The shift register is located at I/O address 8022h. Data bit D0 is shifted in on writes to this address. The shift register is 24 bits long. It contains four address mask bits, an AEN mask bit, a reserved bit, two cycle type bits, and 16 address bits. Table 4 defines the bits. Bits are shifted in starting from bit 23, as defined in Table 4.

A DOS program is provided with the TCDEVPLUS which can be used to program the programmable address decoder. It does this by accepting command line arguments and programming the 24-bit shift register. The program is called TCDEVAD.EXE and is run with the following parameters:

TCDEVAD –a<xxxx> -c<yy> -m<z> -n

The –a switch defines the I/O address (e.g. –a3f8 for COM1). The default address is 80h.

The –c switch defines the cycles type: -cr for I/O reads, -cw for I/O writes and –crw for both I/O reads and writes.

The –m switch allows you to specify which address bits A0 – A3 should be ignored. For example, -m0 says all address bits are included in the decode process, and the address decoder will respond to a single I/O address. The –m1, -m3, -m7 and –mf options ignore 1, 2, 3 and 4 address bits respectively, thus decoding 2, 4, 8 or 16 I/O locates, respectively. The default is –mf.

The –n switch, if used, specifies that the AEN signal should also be excluded from the address decoding. The default is for AEN to be included in address decoding.

SHIFT REGISTER BIT	FUNCTION
23	Ignore A3 when set
22	Ignore A2 when set
21	Ignore A1 when set
20	Ignore A0 when set
19	Ignore AEN when set
18	Reserved for future use
17	Decode I/O writes when set
16	Decode I/O reads when set
15	Bit 15 of address to be decoded
14 – 1	Bits 14 – 1 of address to be decoded
0	Bit 0 of address to be decoded

TABLE 4 - PROGRAMMABLE ADDRESS DECODER SHIFT REGISTER

As well as latching the contents of the data bus for display on the LEDs, the latch output of the address decoder is available at a test point called /LEDCLK, where it can be used to trigger oscilloscopes and logic analysers. On REV B versions of the TCDEVPLUS this test point is Test Point TP15, and on REV C versions of the PCB it is Test Point TP20. Appendix G describes the differences between the two versions of the TCDEVPLUS.

The programmable logic chip also contains logic which is responsible for enabling or disabling the floppy, IDE and COM4 logic.

3.3 POWER SUPPLY MONITOR

We have added a circuit capable of measuring power consumption of PC/104 and GCAT486 boards. This can provide reasonably accurate measurements, both statically and dynamically.

A +5V power supply enters the TCDEVPLUS through connectors J23 or J24. This +5V supply is fed to a 3.3V switch mode power supply, which generates a regulated 3.3V. These 5V and 3.3V supplies are used to power all of the circuitry on the TCDEVPLUS. The power supplies to the PC/104 and GCAT486 sockets, however, are isolated from these 5V and 3.3V supplies. They are usually joined together with jumpers at jumper area J29. As current flows through J29 it can be measured.

The measuring circuit passes the current through a 40 milliohm resistor and measures the voltage across this resistor. The current passing through the resistor is converted to a voltage, which can be measured at J29 pin 10 or test point TP10. Since the voltage at J29 pin 10 varies in real-time with the current, the signal at J29 pin 10 can be displayed on a scope, providing a real-time display of how the current varies with time.

The current and the voltage at J29 pin 10 are related by this equation:

$$I = V/2$$

That is, if the voltage is 1V the current flowing is 500mA.

The jumpers at J29 may be set to measure the current on the 5V rail (to PC/104 boards), or the current on the 3.3V rail (to GCAT486 boards), or neither. Where there is no need to measure the current, or where the voltage drop across the 40 milliohm resistor is unacceptable, the jumpers at J29 can be set to bypass the resistor and provide a direct connection between the power supply output and the power input to the PC/104 or GCAT486 boards.

The power measurement is particularly interesting on boards with power management built in. In these cases the reduction in power consumption can be clearly seen as the processor moves from one power state to another.

Appendix B describes how to set the jumpers on J29 for power measurement.

3.4 SPEAKER

A small speaker is included on the TCDEVPLUS. It is connected to the SPKR output of the PC/104 and GCAT486 processors. The speaker can be disabled with a jumper.

3.5 RESET SWITCH

The small push button switch at the SW4 position is connected to the /RESET line on the processor card. The switch is tracked directly to the J4 I/O connector. A push on the switch will short the /RESET line to GND and hence reset the processor card.

The reset switch is located on the right-hand edge of the TCDEVPLUS.

3.6 BATTERY

Most processor cards rely on CMOS SRAM for storing configuration information such as disk drive parameters. A 3.6V NiMH battery on the TCDEVPLUS is wired to the PC/104 I/O connector to provide a battery supply for the CMOS SRAM and real-time clock on the processor module. The TCDEVPLUS battery is constantly trickle charged from the main +5V supply to keep the battery voltage above 3.6V.

Jumper E2 is used to connect either the battery or +3.3V to pin 28 (BATT) of the 50-way I/O connector. It also goes to the BATT pin on the GCAT486.

In normal operation the jumper should be set to the BAT position. Note that some processors (the TP300 and TP400 in particular) may not operate correctly if their BATT pin is left unconnected.

3.7 IrDA

Most PC/104 processor boards have an option for driving an IrDA infrared data transceiver. An IrDA transceiver is provided on the TCDEVPLUS board and can be used for IrDA data transfer. The IrDA transceiver is connected to the IRRX and IRTX pins on the 50-way I/O cable.

Some early PC/104 processors (the TC386 and TC486) from DSP Design have VCC and GND power connections on these pins of the 50-way connector. Connecting VCC and GND to the IrDA transceiver may damage the transceiver, so this should not be done. On REV B PCBs, to isolate the IrDA transceiver from the TC486 and TC486 remove the single jumper at jumper area E10 and remove resistor R1, which is adjacent to the IrDA transceiver. On REV C PCBs remove both jumpers at the E10 jumper area. See Appendix G for a description of the differences between REV B and REV C PCBs.

3.8 ETHERNET CONNECTOR

DSP Design processor boards with Ethernet controllers do not include the RJ45 connector or the isolation transformer. Instead a cable (the TB486ET-CAB) links the

processor board to a small connector board (such as the TB486ET or the TP400ET) which contains the isolation transformer, the RJ45 connector, passive components and status LEDs. This is because from considerations of signal quality it is better to place the transformer and passive components adjacent to the connector, and the connector will typically be located away from the PC/104 processor in a real system, at the system enclosure.

This circuitry (transformer and RJ45 connector) is present on the TCDEVPLUS.

There are differences in this circuit between the REV B and REV C versions of the TCDEVPLUS. Appendix G describes the differences between the two versions of the board.

The Ethernet connector on the REV B version of the TCDEVPLUS cannot be used reliably with the 10/100Base-T Ethernet controller on the TP400. (Users may find they can use it with acceptable results at 10M bits per second). You should use a TP400ET adapter board for reliable operation with a TP400 and a REV B TCDEVPLUS.

The circuitry on the REV C TCDEVPLUS is the same as that of the TP400ET board. This board is optimised for the DP83815 10/100 Base-T Ethernet controller chip used on the TP400. The RJ45 connector incorporates the transformer, common mode chokes, some passive components and status LEDs within the metal body of the connector. Jumper E13 must be connected when using the TP400, and must be removed when using the TP300 or the TB486.

The circuit on both REV B and REV C versions of the TCDEVPLUS will also be satisfactory for use with the CS8900 10Base-T Ethernet controller chip used on the TB486 and TP300, although we would recommend the use of the TB486ET connector board in production situations. The turns ratio of the 10/100 Base-T transformer is not optimal for the CS8900, and will result in a slightly low transmit signal level. In practice the low signal level is unlikely to cause problems, since Ethernet components are in any case able to adapt to considerable signal attenuation over long runs of cable. Jumper E13 must be connected when using the TP400, and must be removed when using the TP300 or the TB486.

3.9 TEST POINTS

A number of test points have been provided on the TCDEVPLUS. These are primarily for DSP Design's production testing, but some may be of use to customers during development of PC/104 or GCAT486 systems.

The REV C version of the TCDEVPLUS has three extra test points, and three test points have different names on the REV C PCB. Appendix G describes the differences between the two versions of the PCB.

Table 5 lists the test points and their connections.

TEST POINT		CONNECTION	NOTES
REV B	REV C		
TP1	TP1	/ROMRD	Used for TB486 BIOS programming
TP2	TP2	BUSCLK	ISA bus clock
TP3	TP3	OSC	ISA bus clock
TP4	TP4	/CD_A	GCAT486 PCMCIA signal
TP5	TP5	RST_A	GCAT486 PCMCIA signal
TP6	TP6	/PCMA_VCC	GCAT486 PCMCIA signal
TP7	TP7	/CD_B	GCAT486 PCMCIA signal
TP8	TP8	RST_B	GCAT486 PCMCIA signal
TP9	TP9	/PCMB_VCC	GCAT486 PCMCIA signal
TP10	TP10	ICC	Output voltage from current monitoring circuit.
TP11	TP11	VLCD	GCAT486 LCD power supply generator
TP12	TP12	VPOS	GCAT486 positive Vee voltage
TP13	TP13	Vo	GCAT486 negative Vee voltage
TP14	TP14	VEE	GCAT486 negative Vee voltage
-	TP15	3.3V	3.3V power supply
-	TP16	GND	Ground (0V of power supply)
-	TP17	VCC	+5V power supply
TP18	TP18	/BL1	GCAT486 /BL1 Signal
TP19	TP19	/BL2	GCAT486 /BL2 Signal
TP15	TP20	/LEDCLK	Status LED latch signal
TP16	TP21	XCE	EPROM enable gating signal
TP17	TP22	COM4 IRQ	Super I/O chip IRQ pin for COM4

TABLE 5 - TEST POINTS

3.10 USING ISA AND PCI BUS EXPANSION BOARDS

Sockets are present on the TCDEVPLUS to accept both ISA bus and PCI bus expansion boards. These are boards that will plug into a standard desk-top PC. This can be particularly useful during development work, as it allows standard boards to be driven by DSP Design's processors.

3.10.1 ISA Bus Expansion Boards

ISA bus boards can be plugged into connector J32. Both sections of the connector are used by 16-bit boards, and just one section is used by 8-bit boards.

The ISA bus connector is connected to the ISA signals on both sets of PC/104 bus connectors (J2/J2 and J34/J35) as well as the ISA signals on the GCAT486. Note that you should avoid driving the IRQ3 and IRQ4 signals when using the GCAT486, as these signals are not 5V-tolerant on the GCAT486.

3.10.2 PCI bus Expansion Boards

The PCI connector is configured as PCI Slot 2, and is thus wired to INTB#, REQ1#, ACK1# and CLK1. It operates as PCI logical device 0Bh. See the TP300 and TP400 Technical Reference Manuals, section 4.3 for further information.

PCI bus boards can be plugged into connector J33. This connects PCI bus boards to the PCI bus interface, J3, on TP300 and TP400 processor boards.

Care must be taken with the orientation of PCI bus boards. Boards must be installed with the bracket containing their connectors positioned in the slot cut out of the edge of the TCDEVPLUS PCB, straddled by the Compact Flash connector. Boards with 3.3V-only signaling will plug in, but only in the wrong orientation. This will damage the boards and must not be done.

The signaling voltage of PCI bus boards is reflected in their edge connector. Boards with 5V signaling have a slot cut in the gold-plated edge connector at the end furthest from their connector bracket. Boards with 3.3V signaling have a slot cut in the gold-plated edge connector at the end closest to their connector bracket. Boards which can accept both 5V and 3.3V signaling have slots cut in both positions.

There is a corresponding plug in the PCI bus connector which engages with the slots, or not as the case may be. This ensures that boards which cannot accept the available signaling voltage cannot be plugged into the connector.

The J33 PCI connector on the TCDEVPLUS has, by default, its plug installed for 5V signaling. Thus 5V-only and dual-voltage PCI bus cards can be plugged in. **Boards with 3.3V-only signaling will plug in, but only in the wrong orientation. This will damage the boards and must not be done.**

You should also note that the Geode GX1 processor used on the TP400 does not have 5V tolerant PCI bus signals. This means that it must not be used by 5V-only PCI bus boards. It can be used by those boards which can operate with both 5V and 3.3V signaling, and by boards which use 3.3V signaling only.

There is an anomaly with the TP400. The TP400 has 3.3V-only signaling, yet the PCI bus socket prevents 3.3V-only PCI boards from being plugged in. It is possible (theoretically at any rate) to desolder the PCI bus connector from REV C versions of the TCDEVPLUS, rotate it by 180 degrees and re-solder it. This will move the signaling voltage plug to the other end, suitable for 3.3V boards.

4 GCAT486 SUPPORT CIRCUITRY

The GCAT486 requires circuitry to allow it to operate in a PC/104 or ISA bus environment. This is for a number of reasons: The GCAT486 runs from a 3.3V power supply and most of the rest of the TCDEVPLUS runs on 5V, the GCAT486 does not provide ISA bus clock signals, and the GCAT486 needs additional circuitry to implement a printer port. The TCDEVPLUS provides this necessary circuitry.

The GCAT486 Technical Reference Manual contains the circuit of the GCAT486DEV. This is an earlier development system which has been superceded by the TCDEVPLUS. Nevertheless, it contains much the same GCAT486 support circuitry as the TCDEVPLUS, and GCAT486 users are invited to refer to the GCAT486 Technical Reference Manual for a discussion in greater depth of the support circuitry. The GCAT486 support circuitry on the TCDEVPLUS is very similar to that on the GCAT486DEV.

4.1 POWER SUPPLY

The GCAT486 runs from 3.3V. The TCDEVPLUS includes a DC-DC power supply, which generates a 3.3V supply for the GCAT486 from the 5V supply of the TCDEVPLUS. The 3.3V output is routed to the GCAT486's 3V3 and VCC_CPU signals through jumpers on jumper area J29. Jumpers at J29 can be positioned to allow power consumption to be measured, or alternative power supplies to be used.

A power supply monitor circuit allows for the GCAT486 power consumption to be measured. The circuit produces a voltage proportional to the current, which can be monitored either by a multimeter, or by a scope, to report on steady-state or dynamic current consumption respectively. This is described in section 3.3.

4.2 CLOCK GENERATOR

The Elan processor on the GCAT486 does not generate ISA bus clocks. Circuitry on the TCDEVPLUS does generate these two missing ISA bus clocks – BUSCLK at 8MHz and OSC at 14.318MHz. The clock generator routes the signals through to the PC/104 and ISA sockets only when a GCAT486 is installed; when a PC/104 processor is in use the clock generator is disabled as the PC/104 processors generate their own clocks.

4.3 DATA BUS BUFFERS

The GCAT486 can operate with 3.3V and 5V peripheral circuitry, as most I/O pins on the Elan processor are 5V tolerant. The main exception to this is the 16-bit data bus, SD0-15 (actually, the problem with these signals is not at the Elan itself, but at the Flash and UART chips which are attached to SD0-15 and which do not have 5V tolerant pins). Thus if connecting the GCAT486 to 5V logic a voltage translation buffer must be used on the SD0-15 bus. On the TCDEVPLUS Development System DSP Design have used a 16-bit bi-directional CMOS switch, the PI5C162245 from Pericom Semiconductor, which can be used for this voltage translation.

Care must also be taken with the Elan's PIRQ0 and PIRQ1 (configured as IRQ3 and IRQ5). These interrupt pins must not be driven higher than 3.3V, as they are connected to the on-board UART chip, which does not have 5V tolerant inputs.

4.4 SUSPEND / RESUME SWITCH

Gates are provided around SW5 to generate a debounced suspend/resume signal. This connects to the GCAT486 SUS_RES signal, which can be used by software to force to GCAT into and out of its low power suspend state.

4.5 PRINTER PORT

Chips have been provided on the TCDEVPLUS to implement the data port of a printer port, if the printer function is required. To use the printer port the circuitry must be enabled at jumper area E9 on the TCDEVPLUS. The printer must also be enabled in the GCAT486's Setup menu. The circuit on the TCDEVPLUS requires that the printer port mode is set to bi-directional in the GCAT486 Setup menu.

Users should note that the control output signals have only weak pull-up resistors, which means that they take a little time to make a 0 to 1 logic transition. This may affect operation of some software. When operating the printer port as an input port, note that there are pull-up resistors on the PD0-2 signals, but no pull-up resistors on the PD3-7 signals. (This is because PD0-2 are connected to the programmable logic chip, where they are used for in-circuit programming. The programmable logic chip has internal pull-up resistors).

Note that the printer port signals are multi-function pins from the GCAT486, and are shared with other functions: GPIO and PCMCIA Slot B. These alternative functions cannot be used while the printer port is in operation.

4.6 LCD SUPPORT

The GCAT486 is capable of driving colour and mono LCDs of a variety of sizes. A total of five connectors are provided on the TCDEVPLUS to allow connection to different LCDs. Table 6 lists the four displays which DSP Design have used with the GCAT486, and their connectors. In addition, connector J22 provides all of the LCD signals on a 20-way pin header, thus allowing a ribbon cable to be used to connect to any other type of LCD.

The GCAT486 contains an on-board Vee generator, capable of generating the negative bias voltage typically required by mono LCDs. Many colour LCDs require a positive Vee voltage. The TCDEVPLUS includes a positive Vee voltage generator. This generator generates a signal called VPOS.

The VPOS circuit is designed to track the Vee voltage from the GCAT486, to within a few volts. When Vee goes more negative, VPOS becomes more positive. This means that the VR1 on the GCAT486, and any software-controlled changes to Vee, can be used to make corresponding changes to VPOS.

VPOS is disabled entirely when the GCAT486 VLCD voltage is off.

See section 4.7 for a discussion of alphanumeric LCD support.

DISPLAY	DMF50840NF-FW	LMG7525RFPFF	LM5Q32	K3240-FR
MANUFACTURER	Optrex	Hitachi	Sharp	Citizen
COLOUR/MONO	Mono	Mono	Colour	Colour
RESOLUTION	320 x 240	320 x 240	320 x 240	320 x 240
CONNECTOR	J18	J28	J20	J19
NO. OF PINS	14	12	20	20
PITCH	1.25mm	1.0mm	0.8mm	0.5mm
CONNECTOR TYPE	39-51-3144	12FMN-BTK	52557-2090	52745-2090
CONNECTOR MAN.	Molex	JST	Molex	Molex

TABLE 6 - LCD OPTIONS

4.7 ALPHANUMERIC LCD

An alphanumeric LCD can be connected to J31. The program GC4ALPHA is a sample program showing how to use GCAT486 GPIO lines to access an alphanumeric LCD. The VR2 potentiometer allows for adjustment of the LCD contrast, and solder link area LK1 allows for a choice of power supply to the LCD.

4.8 GCAT486P2

The PCMCIA adapter board for the GCAT486, called the GCAT486P2, can be plugged onto the TCDEVPLUS, alongside the GCAT486. Note that the slot B PCMCIA signals have multiple functions (they can also be printer port or GPIO pins). It is not possible to use the GCAT486P2 unless these multifunction pins are set to be PCMCIA control signals. Similarly, the GCAT486 printer must be disabled at E9.

4.9 KEY MATRIX

A key matrix keypad can be attached at J21. This connector has the correct pin assignment to facilitate connection to the Cherry G84-4000 QWERTY keyboard. Note that many of the key matrix signals are Elan pins with multiple functions. This means that when a pin is configured for its key matrix function the alternative function is lost. When operating a full keypad on the TCDEVPLUS you must disconnect the XT keyboard and disable the floppy disk controller, since the XT keyboard signals and IRQ6 are amongst the pins which are used by the full keypad. In addition, some of the ISA bus signals become keypad signals, which results in slightly anomalous behavior on the TCDEVPLUS – the VGA cursor ends up in the wrong place on the screen, and power management with the key matrix does not work properly. These problems go away when the GCAT486 is separated from the TCDEVPLUS.

(This page is intentionally left blank)

APPENDIX A: SPECIFICATION

Product:	TCDEVPLUS
Description:	Embedded PC Development System for PC/104 and GCAT486 processor boards.
Dimensions:	10.825 x 7.45 inches (275mm x 189mm)
Weight:	900g approx.
Operating temperature:	0 - 70 degrees C.
Humidity:	10% - 90% non-condensing.
Power Supplies:	350mA approx. at +5V(excluding current drawn by any PC/104 or GCAT486 boards).

(This page is intentionally left blank)

APPENDIX B: TCDEVPLUS SET-UP PROCEDURE.

This appendix describes the jumper and solder link settings for the TCDEVPLUS.

Note that there are two versions of the TCDEVPLUS in the field – the REV B and the REV C PCBs – and these differ to some extent in their jumper options. This Appendix covers both versions. The two versions can be distinguished by the text near the serial number patch: REV B boards include the number 186201.B00 and REV C boards have the text 186201.C00. Also, and more easily, the battery on the REV B board is near the EPROM socket and on the REV C board is near the power supply connector. Appendix G describes the differences between the two versions.

The component placement diagrams in Appendix C may be of help in locating the solder links referred to in this appendix. Appendix C includes the component placement diagrams for both the REV B and REV C PCBs.

A number of functions can be configured with jumpers and a number with solder links. Jumpers have been provided where there is a likelihood of having to change settings frequently. Solder links are provided where settings are unlikely to need to be changed.

As far as possible the names and functions of the jumpers are the same as they were on the earlier TCDEV Development System.

Care must be taken when changing these the solder link areas so that no accidental shorts are produced.

Default settings are noted below.

B.1 JUMPER AREAS

E1 Speaker

This jumper is fitted to enable the TCDEVPLUS speaker.

To enable speaker:	Install jumper (default).
To disable speaker:	Remove jumper.

E2 Battery

This jumper selects the voltage which feeds the BATT signal on the PC/104 50-way I/O connector. This voltage is used to support CMOS SRAM and the real time clock. The jumper selects either the NiMH battery or the TCDEVPLUS 3.3V power rail as the source of the BATT power.

To select the battery:	Place jumper in BAT position (default).
To select 3.3V supply:	Place jumper in 3V3 position.

E3 Enable VGA Graphics

This jumper enables or disables the TCDEVPLUS on-board VGA controller. This jumper must be set together with the E6 jumper marked C000.

To enable VGA controller:	Place jumper in EN position (default).
To disable VGA controller:	Place jumper in DIS position.

E4 Enable IDE Controller

This jumper enables or disables the TCDEVPLUS on-board IDE controller.

To enable IDE controller:	Place jumper in EN position (default).
To disable IDE controller:	Place jumper in DIS position.

TP300 and TP400 users will have to set jumper E4 to the DIS (disable) setting, or enter the BIOS setup program and disable the TP300/TP400 internal IDE and floppy disk controllers. This is because, by default, the TP300 and TP400 have their internal IDE and floppy disk controllers enabled.

E5 Enable Floppy Disk Controller

This jumper enables or disables the TCDEVPLUS on-board floppy disk controller.

To enable floppy disk controller:	Place jumper in EN position (default).
To disable floppy disk controller:	Place jumper in DIS position.

E6 EPROM Address Decoding

This jumper area is part of the address decoding circuit for the BIOS EPROM. The 256k byte block in the memory space between C0000h and FFFFFh is split into eight 32k-byte blocks, each of which can be individually enabled or disabled by jumpers at E6.

Normally all of the EPROM will be disabled, with the possible exception of the jumper marked C000, which enables the VGA BIOS at memory address C0000h. The EPROM socket is of use, however, if you ever corrupt the BIOS image contained in flash memory on the processor card. In this circumstance a BIOS image can be placed into an EPROM, the EPROM enabled at E6, the flash chip disabled, and the processor can boot from the EPROM rather than the flash chip.

To enable or disable the TCDEVPLUS VGA display controller, E6 and E3 must both be changed.

Appendix F describes reprogramming the BIOS on a number of DSP Design processor cards.

Table B1 lists the functions of E6.

PCB MARKING	DEFAULT SETTING	MEMORY RANGE	SEGMENT:OFFSET OF STARTING ADDRESS
F800	DIS	F8000h – FFFFFh	F800:0
F000	DIS	F0000h – F7FFFh	F000:0
E800	DIS	E8000h – EFFFFh	E800:0
E000	DIS	E0000h – E7FFFh	E000:0
D800	DIS	D8000h – DFFFFh	D800:0
D000	DIS	D0000h – D7FFFh	D000:0
C800	DIS	C8000h – CFFFFh	C800:0
C000	EN	C0000h – C7FFFh	C000:0

TABLE B1 - E6 JUMPER AREA

E7 Address of Status LEDs

This jumper area defines the I/O address which the LEDs monitor.

Writes to port 80h (POST):	Link A1 – A2 and B1 – B2 (default).
Writes to port 378h (printer):	Link A1 – A2 and B2 – B3
Reserved for future use:	Link A2 – A3 and B1 – B2
Programmable address:	Link A2 – A3 and B2 – B3

E8 Enable COM4

This jumper enables or disables the TCDEVPLUS on-board COM4 serial port.

To enable COM4:	Place jumper in EN position.
To disable COM4:	Place jumper in DIS position (default).

E9 Enable GCAT486 Printer Port

This jumper enables or disables the GCAT486 printer port. The printer on the GCAT486 uses multi-function pins (the alternative functions are GPIO and PCMCIA Slot B) and so the printer can only be enabled if the other functions are not in use.

To enable GCAT486 printer:	Place jumper in EN position.
To disable GCAT486 printer:	Place jumper in DIS position (default).

E10 Enable IrDA

This link connects pin 1 of the PC/104 50-way I/O connector to the IrDA optical transceiver Rx output pin. On most of DSP Design's processor boards pins 1 and 2 of the 50-way connector are IrDA receive and transmit respectively, but on the TC386 and TC486 these pins are GND and VCC respectively. When using the TC386 and TC486 the following precautions must be taken, to prevent damage to the IrDA transceiver.

On REV B PCBs the single jumper at jumper area E10 must be removed and the resistor R1 must also be removed. On REV C PCBs the two jumpers at the E10 jumper area must be removed. See Appendix G for a description of the differences between the two versions of the TCDEVPLUS.

To enable the IrDA transceiver: Install jumper.
To disable the IrDA transceiver: Remove jumper(s) (default).
If using TC386 or TC486 with REV B TCDEVPLUS PCBs, R1 must also be removed.

E11 GCAT486 Boot Option

Enables the GCAT486 to boot from PCMCIA cards. This jumper should not be fitted, and is intended for future use only.

E12 IDE Connectors /IOCS16 Signal

This jumper area is present on the REV C PCBs, but not on the REV B PCBs.

See section 2.2 for a description of what to do on REV B versions of the TCDEVPLUS.

See Appendix G for a description of the differences between the two versions of the TCDEVPLUS.

It is used to disconnect the /IOCS16 on the IDE connectors from the /IOCS16 signal on the PC/104 bus. This is necessary when using TP300 and TP400 processor boards, but then only when the IDE connector on the TP300 or TP400 is connected by a cable to the IDE connector on the TCDEVPLUS.

To connect the /IOCS16 signal: Install jumper (default).
To disconnect the /IOCS16 signal: Remove jumper.

E13 10/100Base-T Ethernet Magnetics

This jumper area is present on the REV C PCBs, but not on the REV B PCBs.

If you want to use the Ethernet interface of a TP400, and you have a REV B version of the TCDEVPLUS, then see section 3.8.

See Appendix G for a description of the differences between the two versions of the TCDEVPLUS.

This jumper is used to connect a 3.3V power supply to the Ethernet isolation transformer within the RJ45 connector. The 3.3V supply is required by the 10/100Base-T Ethernet controller used on the TP400 processor board. It is not required by the 10Base-T Ethernet controller used on the TP300 and TB486 boards.

To remove the 3.3V power supply (TP300 and TB486):
Remove jumper (default).

To connect the 3.3V power supply (TP400 only): Install jumper

B.2 SOLDER LINKS

LK1 Power Supply for Alphanumeric LCD

An alphanumeric LCD can be connected at J24, for use with the GCAT486. LK1 selects the power supply for the LCD. It should be set in accordance with the LCD manufacturer's data sheet, and whether you wish to supply power from the TCDEVPLUS power supplies or from the GCAT486 VLCD power supply.

Power LCD from GCAT486 VLCD:	Link 1 - 2
Power LCD from 5V (VCC):	Link 2 – 3
Power LCD from 3.3V:	Link 4 – 5 (default)

LK2 Programmable Logic Device

The TCDEVPLUS includes a programmable logic device, which is programmed during manufacture. LK2 is linked during the manufacture and then removed. It should not be linked by the user.

LK3 Super I/O Chip A10

Not Fitted.

LK4 GCAT486 SUS_RES Pin

The GCAT486 SUS_RES pin can be used as a suspend/resume pin or as a key matrix row pin. LK4 routes SUS_RES to the debounced suspend/resume switch or to the key matrix connector J21.

To select KBDROW14:	Link 1 – 2.
To select suspend/resume switch:	Link 2 – 3 (default).

LK5 Compact Flash Master/Slave

This link selects whether a Compact Flash card in J30 behaves as a master or as a slave.

For master operation:	Fit link (default).
For slave operation:	Omit link.

LK6 IDE port /DASP Signal

This link pulls the IDE drive /DASP signal either high or low through a 10k resistor.

For pull-down resistor:	Link 1 – 2.
For pull-up resistor:	Link 2 – 3 (default).

LK7 GCAT486 IrDA Series Resistor

The GCAT486 IrDA transceiver is powered by the signal VIRDA. This signal connects to VCC directly, or through a 10-ohm resistor. LK7 shorts out the resistor to effect the direct connection. (Note that the GCAT486 IrDA transceiver needs to be powered through a current-limiting resistor. Both the GCAT486 and the TCDEVPLUS include a 10-ohm current limiting resistor, and each board has a link which can short out this resistor. It is important not to short out BOTH resistors).

VIRDA connects to VCC directly:	Install link.
VIRDA connects to VCC through 10-ohm resistor:	Omit link (default).

LK8 Super I/O chip IOCHRDY

Fitted.

B.3 POWER SUPPLY MONITORING AT J29

The current flowing from the TCDEVPLUS power supplies to the PC/104 or GCAT486 can be measured at J29.

To measure 5V current to PC/104 boards:
Add jumpers from 3 – 5, 4 – 6 and 7 – 8 (default).

To measure 3.3V current to GCAT486 boards:
Add jumpers from 1 – 2, 3 – 4, 5 – 7 and 6 – 8

For no current measurement (default):
Add jumpers from 1 – 2, 3 - 4, and 7 – 8

Even numbered pins are on one row, odd numbered pins on the other, and the silk screen text shows the positions of pins 1, 2, 9 and 10.

B.4 SWITCHES

The TCDEVPLUS PCB has sites for five switches, although only two are usually fitted. The missing switches are installed only on the boards used internally by DSP Design, where they are used to speed up test and development work.

Switches SW1, SW2 and SW3 are used only by DSP Design.

Switch SW4 is the push-button reset switch.

Switch SW5 is debounced and fed to the GCAT486 SUS_RES pin, where it can be used for power management.

APPENDIX C: COMPONENT PLACEMENT DRAWING

The component placement diagrams in this Appendix may be of use in locating connectors, jumpers and solder links. There are two diagrams. Figure C1 is the component placement diagram for the REV B version of the TCDEVPLUS. Figure C2 is the component placement diagram for the REV C version of the PCB. Appendix G describes the differences between the two versions of the board.

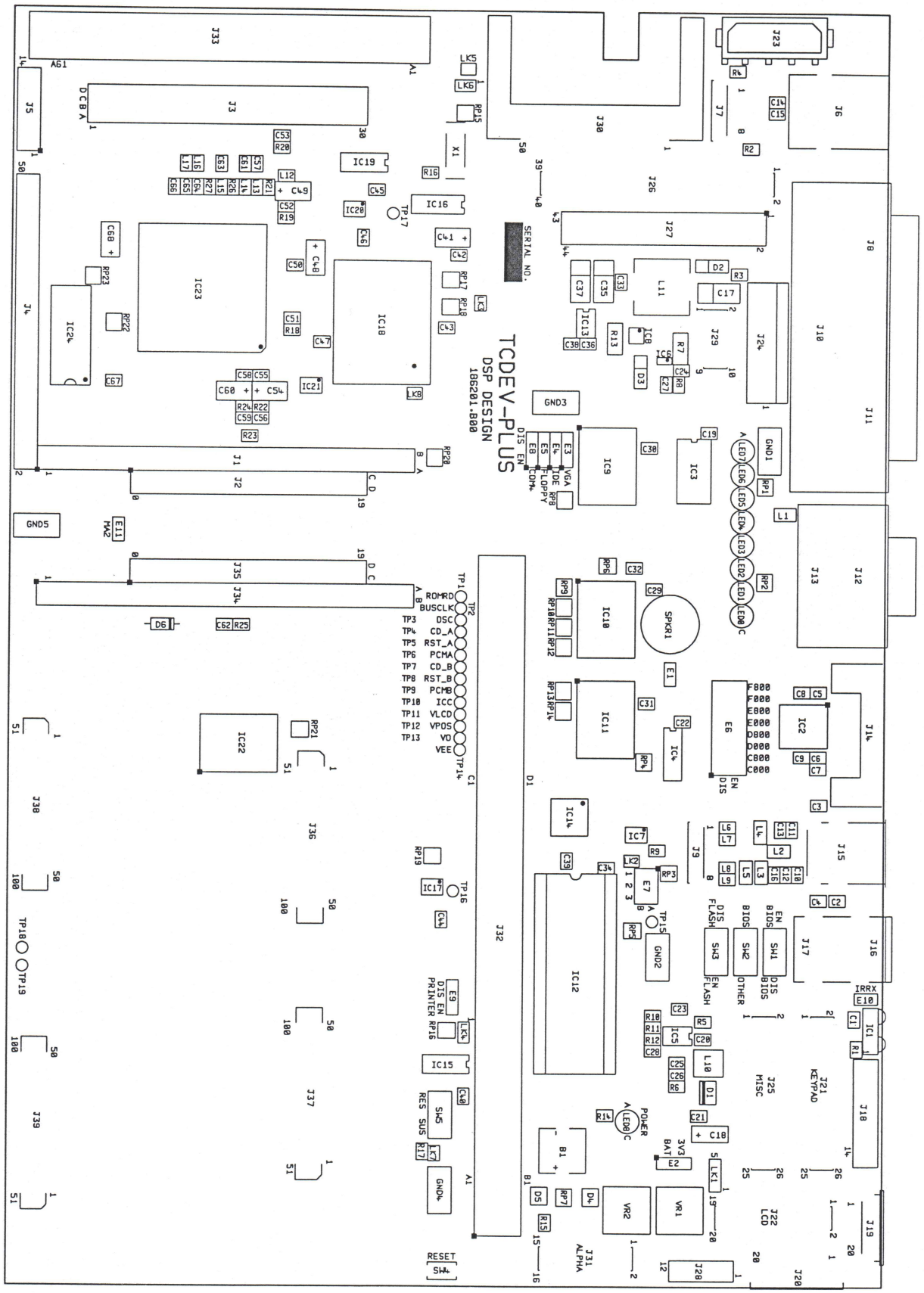

FIGURE C1 - REV B COMPONENT PLACEMENT DIAGRAM

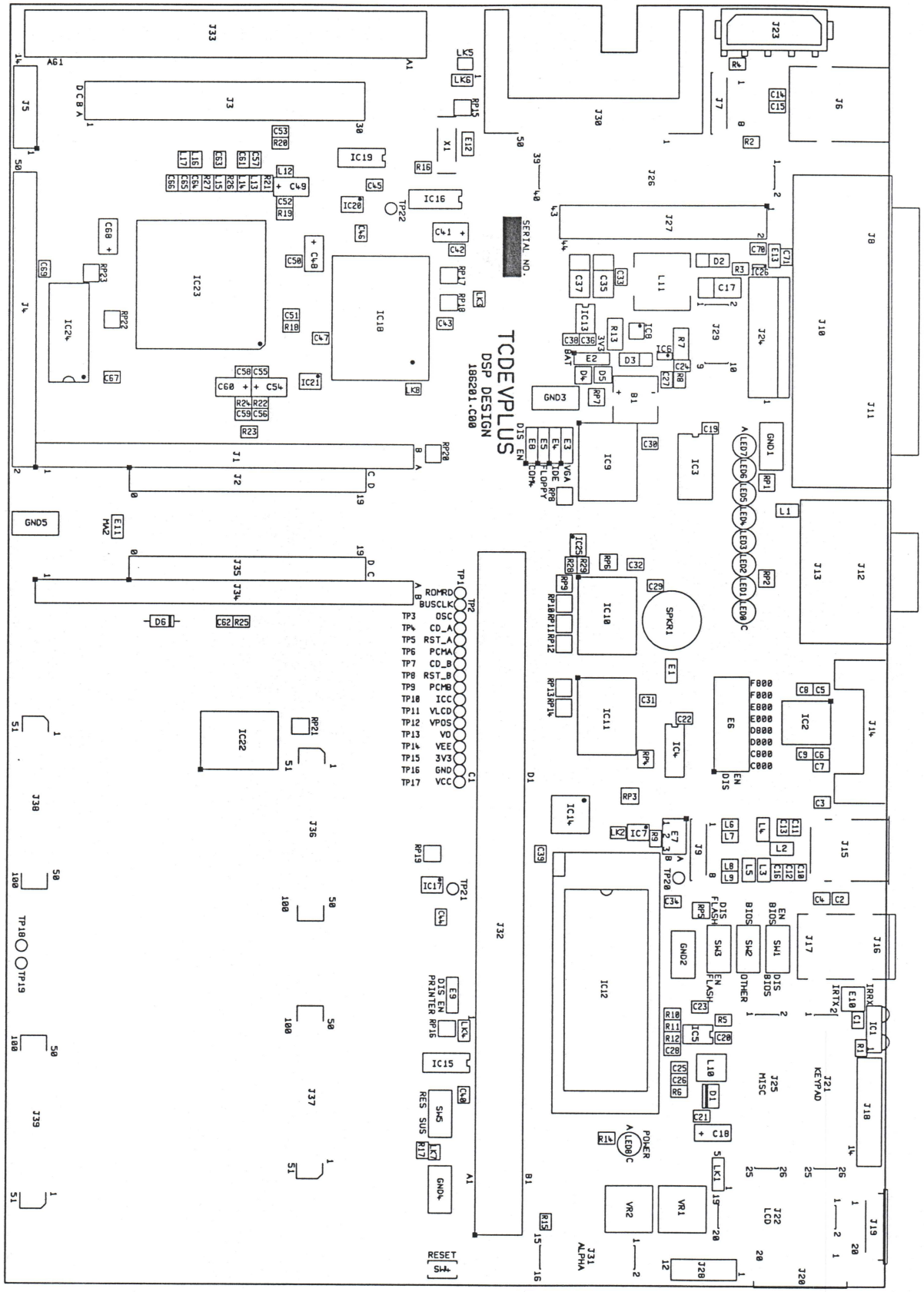

FIGURE C2 - REV C COMPONENT PLACEMENT DIAGRAM

(This page is intentionally left blank)

APPENDIX D: OPTIONS AND ORDERING INFORMATION

This Appendix lists part numbers of the TCDEVPLUS and related items.

D.1 BOARDS AND ACCESSORIES

Table D1 gives the order codes of the TCDEVPLUS and related accessories. Some or all of the following items may be of use during your development process. Some of the items may be included in the "PAK" products. See also the Ordering Information appendix of the Technical Reference Manual for your particular processor board.

ITEM	DESCRIPTION
TCDEVPLUS	Standard TCDEVPLUS processor board.
TRM-TCDEVPLUS	Technical reference manual.
TCDEVPLUS-UTILS	Floppy disk containing the TCDEVAD program and BIOS images.
TPPSU	45W power supply unit for the TCDEVPLUS
TB486ET-CAB	Cable assembly to connect processor Ethernet and USB connectors to the TCDEVPLUS
LCDQVGA	320 X 240 mono LCD and cable to plug into the TCDEVPLUS.
KBDXTAT	Cherry G81-1800-HAG (or G80-1000) XT/AT keyboard.
KBDATPS2	Adapter to allow 5-pin mini-DIN keyboard to plug into the 6-pin mini-DIN keyboard connector.

TABLE D1 - TCDEVPLUS AND ACCESSORIES

D.2 COMPACT FLASH

The TCDEVPLUS has a socket for Compact Flash memory cards, which can be used in place of IDE disk drives. They are reasonably high capacity, and if you equip your PC with the CFREADER product you are able to transfer files between your development machine and the TCDEVPLUS. Compact Flash cards with greater capacities than those listed in Table D2 are also available. The CFREADER is a Compact Flash reader/writer unit that plugs into the printer port of a PC. The CF100 is an adapter board that allows Compact Flash cards to be read through the IDE ports of those PC/104 boards with IDE ports.

ITEM	DESCRIPTION
CF4M	4M byte Compact Flash memory card
CF8M	8M byte Compact Flash memory card
CF16M	16M byte Compact Flash memory card
CF32M	32M byte Compact Flash memory card
CF48M	48M byte Compact Flash memory card
CF80M	80M byte Compact Flash memory card
CF128M	128M byte Compact Flash memory card
CFREADER	Compact Flash reader/writer unit that plugs into the printer port of a PC.
CF100	Compact Flash Adapter board.
CF100-EKIT	Ejector for the Compact Flash socket

TABLE D2 - COMPACT FLASH ACCESSORIES

D.3 PROCESSOR STARTER PACKS

The TCDEVPLUS may be bought separately, but more often it is supplied as a part of a Processor Starter Pack. These "PAK" products include the processor itself, the TCDEVPLUS, a TPPSU power supply and a comprehensive set of manuals, disks, and cable assemblies optimized to that particular processor. The PAK products provide most customers with all that they need for their development process, but there are still other accessories which may be of use, and which will need to be ordered separately. Refer to your processor's Technical Reference Manual for a full list of relevant accessories.

Users who have bought a PAK product for one processor can use it for projects with other processors. You should consider carefully whether you need to buy other accessories beyond the new processor, its Utility Disks and its Technical Reference manual.

The PAK products available are listed below, and the Tables show the contents of each PAK.

D.3.1 TB486PAK

ITEM	DESCRIPTION
TCDEVPLUS	Development System
TPPSU	45W power supply
PSU-xxLEAD	Mains Power Lead for TPPSU (specify your country so we can provide the correct lead)
TRM-TCDEVPLUS	Technical Reference Manual
TCDEVPLUS-UTILS	Floppy disk containing software
TB486	Processor board
TRM-TB486	Technical Reference Manual
TB486-UTILS	Utility Disks
TB486ET-CAB	Cable assembly for TB486ET
TB486CRT-CAB	CRT cable assembly for TB486

Note: This does not include DRAM or LCD cable assemblies which must be ordered separately. The TB486ET is not required since an Ethernet connection is on the TCDEVPLUS. A TB486ET would need to be ordered separately if required when the TB486 is removed from the TCDEVPLUS.

TABLE D3 - CONTENTS OF TB486PAK

D.3.2 TP300PAK

ITEM	DESCRIPTION
TCDEVPLUS	Development System
TPPSU	45W power supply
PSU-xxLEAD	Mains Power Lead for TPPSU (specify your country so we can provide the correct lead)
TRM-TCDEVPLUS	Technical Reference Manual
TCDEVPLUS-UTILS	Floppy disk containing software
TP300	Processor board
TRM-TP300	Technical Reference Manual
TP300-UTILS	Utility Disks
2 x TB486ET-CAB	Cable assembly for TB486ET, TP300USB
TPFAN	Heatsink/Fan combination
TP300CRT-CAB	CRT, audio cable assembly for TP300

Note: This does not include DRAM or LCD cable assemblies which must be ordered separately. The TB486ET and TP300USB are not required since Ethernet and USB connections are on the TCDEVPLUS. A TB486ET and TP300USB would need to be ordered separately if required when the TP300 is removed from the TCDEVPLUS.

TABLE D4 - CONTENTS OF TP300PAK

D.3.3 TP400PAK

ITEM	DESCRIPTION
TCDEVPLUS	Development System
TPPSU	45W power supply
PSU-xxLEAD	Mains Power Lead for TPPSU (specify your country so we can provide the correct lead)
TRM-TCDEVPLUS	Technical Reference Manual
TCDEVPLUS-UTILS	Floppy disk containing software
TP400	Processor board
TRM-TP400	Technical Reference Manual
TP400-UTILS	Utility Disks
2 x TB486ET-CAB	Cable assembly for TB486ET, TP300USB
TC586HS	Heatsink
TP300CRT-CAB	CRT, audio cable assembly for TP400

Note: This does not include DRAM or LCD cable assemblies which must be ordered separately. The TB486ET and TP300USB are not required since Ethernet and USB connections are on the TCDEVPLUS. A TP400ET and TP300USB would need to be ordered separately if required when the TP400 is removed from the TCDEVPLUS.

TABLE D5 - CONTENTS OF TP400PAK

D.3.4 GCAT486PAK

ITEM	DESCRIPTION
TCDEVPLUS	Development System
TPPSU	45W power supply
PSU-xxLEAD	Mains Power Lead for TPPSU (specify your country so we can provide the correct lead)
TRM-TCDEVPLUS	Technical Reference Manual
TCDEVPLUS-UTILS	Floppy disk containing software
GCAT486	Processor board
TRM-GCAT486	Technical Reference Manual
GCAT486-UTILS	Utility Disks
KBDATPS2	5-pin DIN to 6-pin mini-DIN adapter

Note: Customers may also need to order a KBDXTAT if they do not have an XT keyboard. They may also want to order GCAT486P2 and Compact Flash cards.

TABLE D6 - CONTENTS OF GCAT486PAK

(This page is intentionally left blank)

APPENDIX E: CONNECTOR PIN ASSIGNMENTS

This appendix lists all of the connectors on the TCDEVPLUS and gives their pin assignments. There are a total of 41 connectors on this board.

E.1 SUMMARY OF CONNECTORS

Table E1 lists the connectors on the TCDEVPLUS main board. The tables describe the type of the connectors and their functions.

NAME	TABLE	FUNCTION	NO. OF PINS	CONNECTOR TYPE
J1	E16	PC/104 BUS	64 (2 x 32)	SHORT PIN SOCKET STRIP, 0.1"
J2	E17	PC/104 BUS	40 (2 x 20)	SHORT PIN SOCKET STRIP, 0.1"
J3	E18	PC/104-PLUS BUS	120 (4 x 30)	SHORT PIN SOCKET STRIP, 2MM
J4	E21	I/O	50 (2 x 25)	RT. ANGLE PIN HEADER, 0.1"
J5	E22	I/O	14 (2 x 7)	RT. ANGLE PIN HEADER, 0.1"
J6	E6	ETHERNET	12	RJ45 SOCKET
J7	E7	ETHERNET	8	HIROSE DF13 PLUG
J8	E2	COM1	9	9 WAY D-TYPE MALE
J9	E9	USB	8	HIROSE DF13 PLUG
J10	E3	PRINTER	25	25 WAY D-TYPE FEMALE
J11	E4	VGA	15	15 WAY HIGH DENSITY D-TYPE
J12	E2	COM2	9	9 WAY D-TYPE MALE
J13	E2	COM3	9	9 WAY D-TYPE MALE
J14	E2	COM4	9	9 WAY D-TYPE MALE
J15	E8	USB	8 (2 x 4)	2 USB CONNECTORS IN ONE CASE
J16	E5	KEYBOARD	6	2 PS/2 CONNECTORS IN ONE CASE
J17	E5	MOUSE	6	6 WAY MINI DIN
J18	E25	DMF50840 DISPLAY	14	FFC 1.25MM
J19	E27	K3240 DISPLAY	20	FFC 0.5MM
J20	E28	LM5Q32 DISPLAY	20	FFC 0.8MM
J21	E10	KEYPAD	26 (2 x 13)	STRAIGHT PIN HEADER, 0.1"
J22	E29	LCD DISPLAY	20 (2 x 10)	STRAIGHT PIN HEADER, 0.1"
J23	E31	POWER INLET	4	DISK DRIVE POWER
J24	E32	POWER INLET	6	SIL, 0.156"
J25	E11	MISC	26 (2 x 13)	STRAIGHT PIN HEADER, 0.1"
J26	E12	IDE	40 (2 x 20)	STRAIGHT PIN HEADER, 0.1"
J27	E13	IDE	44 (2 x 22)	STRAIGHT PIN HEADER, 2MM
J28	E26	LMG7525 DISPLAY	12	FFC 1.0MM
J29	-	PSU	10 (2 x 5)	PIN HEADER, 0.1"
J30	E14	COMPACT FLASH	50 (2 x 25)	COMPACT FLASH SOCKET
J31	E30	ALPHANUMERIC LCD	16 (2 x 8)	STRAIGHT PIN HEADER, 0.1"
J32	E20	PC/AT	98 (2 x 31 & 2 x 18)	ISA EDGE CONNECTOR
J33	E19	PCI	120 (2 x 60)	PCI FCI SOCKET
J34	E16	PC104	64 (2 x 32)	PIN HEADER, 0.1"
J35	E17	PC104	40 (2 x 20)	PIN HEADER, 0.1"
J36	E23	INTER BOARD	100 (2 x 50)	HIROSE FX8
J37	E23	INTER BOARD	100 (2 x 50)	HIROSE FX8
J38	E24	INTER BOARD	100 (2 x 50)	HIROSE FX8
J39	E24	INTER BOARD	100 (2 x 50)	HIROSE FX8
J40	E15	FLOPPY	40 (2 x 20)	STRAIGHT PIN HEADER, 0.1"
J41	E13	IDE	44 (2 x 22)	STRAIGHT PIN HEADER, 2MM

TABLE E1 - SUMMARY OF CONNECTORS

E.2 PERIPHERAL CONNECTORS

This section describes the 15 connectors associated with connecting to peripheral devices.

E.2.1 Serial Port Connectors

There are four serial port connectors, COM1 to COM4. They all use 9-pin D-type male connectors with the same pin assignments. Table E1 shows which connector is used for each of the serial ports. Note that the pin numbering in this table is in the same order as on the physical connector.

PIN	SIGNAL	PIN	SIGNAL
1	DCD	6	DSR
2	RxD	7	RTS
3	TxD	8	CTS
4	DTR	9	RI
5	GND		

TABLE E2 - SERIAL PORT CONNECTOR PIN ASSIGNMENTS

E.2.2 J10 Printer Connector

The printer port uses connector J10, a 25 – way female D-type connector. Note that the pin numbering in this table is in the same order as on the physical connector.

J10 PIN	SIGNAL	J10 PIN	SIGNAL
1	/STROBE	14	/AUTOFD
2	PD0	15	/ERROR
3	PD1	16	/INIT
4	PD2	17	/SLCTIN
5	PD3	18	GND
6	PD4	19	GND
7	PD5	20	GND
8	PD6	21	GND
9	PD7	22	GND
10	/ACK	23	GND
11	BUSY	24	GND
12	PE	25	GND
13	SLCT		

TABLE E3 - J10 PRINTER CONNECTOR PIN ASSIGNMENTS

E.2.3 J11 VGA Connector

The VGA monitor uses connector J11, a 15 – way high-density female D-type connector. Note that the pin numbering in this table is in the same order as on the physical connector.

PIN	SIGNAL	PIN	SIGNAL	PIN	SIGNAL
1	RED	6	AGND	11	N/C
2	GREEN	7	AGND	12	N/C
3	BLUE	8	AGND	13	HSYNC
4	N/C	9	N/C	14	VSYNC
5	GND	10	GND	15	N/C

TABLE E4 - J11 VGA CONNECTOR PIN ASSIGNMENTS

E.2.4 PS/2 Keyboard and Mouse

There are two PS/2 connectors: J16 for keyboard and J17 for mouse. They are 6-pin mini-DIN connectors with the same pin assignments. Figure E1 shows the pin positions, as viewed looking into the connector.

PIN	SIGNAL
1	/DATA
2	N/C
3	GND
4	VCC
5	/CLOCK
6	N/C

TABLE E5 - PS/2 KEYBOARD AND MOUSE PIN ASSIGNMENTS

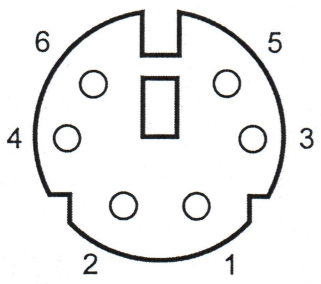

FIGURE E1 - PS/2 KEYBOARD AND MOUSE CONNECTORS

E.2.5 J6 RJ45 Ethernet Connector

J6 is an RJ45 Ethernet connector. It incorporates an isolation transformer. The two unused twisted pairs are terminated within the RJ45 socket. Pins 4 and 5 are tied together, and both connected through an RC network to Chassis GND. Pins 7 and 8 are treated the same way.

In order to use the Ethernet connector it is necessary to add a TB486ET-CAB cable between the processor board and a mating connector (J7) on the TCDEVPLUS PCB, near J6.

J6 PIN	SIGNAL
1	TX+
2	TX -
3	RX+
4	Unused Pair 1
5	Unused Pair 1
6	RX -
7	Unused Pair 2
8	Unused Pair 2

TABLE E6 - RJ45 ETHERNET CONNECTOR PIN ASSIGNMENTS

E.2.6 J7 Ethernet Cable Connector

In order to use the RJ45 Ethernet connector it is necessary to add a TB486ET-CAB cable between the processor board and a mating connector on the TCDEVPLUS PCB. This is connector J7, an 8-pin Hirose DF13 SIL connector.

J7 PIN	SIGNAL
1	RXD+
2	RXD-
3	N/C
4	GND
5	/LINKLED
6	/LANLED
7	TXD-
8	TXD+

TABLE E7 - J7 ETHERNET CONNECTOR PIN ASSIGNMENTS

E.2.7 J15 USB Connectors

There are two USB connectors: J15a and J15b. They are combined in a single housing. They are 4-pin connectors with the same pin assignments.

In order to use the USB connectors it is necessary to add a TB486ET-CAB cable between the processor board and a mating connector (J9) on the TCDEVPLUS PCB near J15.

J15A PIN	SIGNAL	J15B PIN	SIGNAL
1	VCC_1	1	VCC_2
2	DNEG_1	2	DNEG_2
3	DPOS_1	3	DPOS_2
4	GND_1	4	GND_2

TABLE E8 - J15A AND J15B CONNECTOR PIN ASSIGNMENTS

E.2.8 J9 USB Cable Connector

In order to use the USB connectors it is necessary to add a TB486ET-CAB cable between the processor board and a mating connector on the TCDEVPLUS PCB. This is connector J9, an 8-pin Hirose DF13 SIL connector.

J9 PIN	SIGNAL
1	USB_DM1
2	USB_DP1
3	USB_VCC1
4	GND
5	USB_VCC2
6	GND
7	USB_DM2
8	USB_DP2

TABLE E9 - J9 USB CONNECTOR PIN ASSIGNMENTS

E.2.9 J21 Keypad Connector

A key matrix may be connected to the GCAT486 through connector J21. The pin assignments of this are optimized for the Cherry G84-4000 keypad. Note that many of the signals used by a keypad are multi-function pins on the GCAT486. These are marked with an asterisk (*) in the Table. Refer to the GCAT486 Technical Reference Manual for a full description of the keypad, and of the multi-function pins.

Connector J21 is a 26-way DIL header. Pin positions 1,2,25 and 26 are indicated on the PCB.

J21 PIN	SIGNAL	J21 PIN	SIGNAL
1	KBD_COL7	2	KBD_COL4 *
3	KBD_COL0 *	4	KBD_COL1 *
5	KBD_COL5 *	6	KBD_COL6 *
7	N/C	8	KBD_ROW11 *
9	KBD_ROW14 *	10	KBD_ROW10 *
11	KBD_ROW13	12	KBD_ROW12 *
13	KBD_ROW6	14	KBD_ROW5
15	KBD_COL3 *	16	KBD_ROW0
17	KBD_COL2 *	18	KBD_ROW1
19	KBD_ROW7 *	20	KBD_ROW8 *
21	KBD_ROW9 *	22	KBD_ROW2
23	KBD_ROW3	24	KBD_ROW4
25	GND	26	GND

TABLE E10 - J21 KEYPAD CONNECTOR PIN ASSIGNMENTS

E.2.10 J25 Miscellaneous Connector

A number of GCAT486 signals are gathered together in one connector. Connector J25 is a 26-way DIL header.

Note that the GCAT486 GPIO pins have multiple functions. See the GCAT486 Technical Reference Manual.

Pins 17 and 18 have two functions. When using the GCAT486 they are GPIO pins. When using PC/104 bus processors they are TTL level COM4 transmit and receive data signals from J5.

Pin positions 1, 2, 25 and 26 are indicated on the PCB.

PIN	SIGNAL	DESCRIPTION	PIN	SIGNAL	DESCRIPTION
1	ADC0	GCAT486 A/D Input	2	ADC1	GCAT486 A/D Input
3	ADCGND	GCAT486 A/D GND	4	ADCGND	GCAT486 A/D GND
5	ADC2	GCAT486 A/D Input	6	ADC3	GCAT486 A/D Input
7	ADCGND	GCAT486 A/D GND	8	ADCGND	GCAT486 A/D GND
9	VREF	GCAT486 A/D Reference	10	VIRDA	GCAT486 IrDA supply voltage
11	SIRIN	GCAT486 IrDA signal	12	SIROUT	GCAT486 IrDA signal
13	BATT	Battery (Pin 2 of jumper E2)	14	GND	GND
15	VCC	+5V power supply	16	/RESET	Reset to processors
17	GPIO13	GCAT486 GPIO pins or /TxD4	18	GPIO14	GCAT486 GPIO pins or /RxD4
19	GPIO15	GCAT486 GPIO pins	20	GPIO16	GCAT486 GPIO pins
21	GPIO17	GCAT486 GPIO pins	22	VCC	+5V power supply
23	GND	GND	24	GPIO18	GCAT486 GPIO pins
25	GPIO22	GCAT486 GPIO pins	26	ATCLK	

TABLE E11 - J25 MISC CONNECTOR PIN ASSIGNMENTS

E.3 DISK DRIVE CONNECTORS

There are three IDE connectors, one floppy disk connector and one Compact Flash connector. The TCDEVPLUS includes an IDE Disk Drive Controller, which is connected to all three IDE connectors and to the Compact Flash socket.

E.3.1 J26 IDE Connector

Connector J26 is a 40-way 0.1" pin header. It connects to 3.5" IDE disk drives. If using this connector a separate power supply for the IDE drive is required.

Pin 1, 2, 39 and 40 are indicated on the PCB.

J26 PIN	SIGNAL	J26 PIN	SIGNAL
1	/IDRESET	2	GND
3	IID7	4	ID8
5	ID6	6	ID9
7	ID5	8	ID10
9	ID4	10	ID11
11	ID3	12	ID12
13	ID2	14	ID13
15	ID1	16	ID14
17	ID0	18	ID15
19	GND	20	N/C
21	N/C	22	GND
23	/IIOW	24	GND
25	/IIOR	26	GND
27	IIOCHRDY	28	IALE
29	N/C	30	GND
31	IIRQ14	32	/IIOC16
33	IA1	34	/PDIAG
35	IA0	36	IA2
37	/ICS0	38	/CS1
39	/DASP	40	GND

TABLE E12 - J26 IDE CONNECTOR PIN ASSIGNMENTS

E.3.2 J27 and J41 IDE Connectors

Connectors J27 and J41 are 44-way 2mm-pitch header. They connect to 2.5" IDE disk drives. These connectors carry power to the IDE disk drives.

Pin 1, 2, 43 and 44 of J27 are indicated on the PCB.

J41 connector is located on the underside of the PCB, allowing you to fit an IDE drive to the underside of the TCDEVPLUS. Pin positions 1 and 44 are indicated on the PCB.

J27 PIN	SIGNAL	J27 PIN	SIGNAL
1	/IDRESET	2	GND
3	IID7	4	ID8
5	ID6	6	ID9
7	ID5	8	ID10
9	ID4	10	ID11
11	ID3	12	ID12
13	ID2	14	ID13
15	ID1	16	ID14
17	ID0	18	ID15
19	GND	20	N/C
21	N/C	22	GND
23	/IIOW	24	GND
25	/IIOR	26	GND
27	IIOCHRDY	28	IALE
29	N/C	30	GND
31	IIRQ14	32	/IIOC16
33	IA1	34	/PDIAG
35	IA0	36	IA2
37	/ICS0	38	/CS1
39	/DASP	40	GND
41	VCC	42	VCC
43	GND	44	N/C

TABLE E13 - J27 AND J41 IDE CONNECTOR PIN ASSIGNMENTS

E.3.3 J30 Compact Flash Connectors

Connector J30 is a 50 Way Compact Flash connector that can accommodate a Compact Flash Card. The connector carries 3.3V power to the Compact Flash card. Compact Flash cards can operate in a number of modes, including a mode that makes them appear as IDE disk drives.

Pin 39 is connected to solder link LK5. Shorting pin 39 to GND through LK5 makes the Compact Flash operate as a master; removing the link makes it operate as a slave.

J30 PIN	SIGNAL	J30 PIN	SIGNAL
1	GND	26	N/C
2	ID3	27	ID11
3	ID4	28	ID12
4	ID5	29	ID13
5	ID6	30	ID14
6	ID7	31	ID15
7	/ICS0	32	/ICS1
8	GND	33	N/C
9	GND	34	/IIOR
10	GND	35	/IIOW
11	GND	36	VCC
12	GND	37	IIRQ14
13	VCC	38	VCC
14	GND	39	/CSEL
15	GND	40	N/C
16	GND	41	/IDERESET
17	GND	43	IIOCHKRDY
18	IA2	43	N/C
19	IA1	44	VCC
20	IA0	45	/DASP
21	ID0	46	/PDIAG
22	ID1	47	ID8
23	ID2	48	ID9
24	/IIOCS16	49	ID10
25	N/C	50	GND

TABLE E14 - J30 COMPACT FLASH CONNECTOR PIN ASSIGNMENTS

E.3.4 J40 Floppy Connector

Connector J40 is a 40-way DIL pin header connector, mounted on the underside of the PCB. It connects to the floppy disk drive on the underside of the TCDEVPLUS. The 40-way connector is attached to a cable assembly. The cable assembly has a 34-way connector for the floppy disk drive data pins and six pins which provide power to the floppy drive.

Pins 1- 6 of the J40 connector supply power to the floppy disk drive, and pins 7-40 connect to the 34-way data connector. Note that unlike PCs there is no need to add a twist to the data cable. The drive is configured as drive 0, not drive 1.

Pin position 40 is indicated on the PCB.

J40 PIN	SIGNAL	J40 PIN	SIGNAL
1	GND	2	GND
3	GND	4	GND
5	VCC	6	VCC
7	GND	8	/HDS
9	GND	10	N/C
11	GND	12	N/C
13	GND	14	/INDEX
15	GND	16	/DRV0
17	GND	18	/DRV1
19	GND	20	/MO1
21	GND	22	/MO0
23	GND	24	/DIRC
25	GND	26	/STEP
27	GND	28	/WD
29	GND	30	/WE
31	GND	32	/TK00
33	GND	34	/WPT
35	GND	36	/RDATA
37	GND	38	/HS
39	GND	40	/DSKCHG

TABLE E15 - J40 FLOPPY CONNECTOR PIN ASSIGNMENTS

E.4 EXPANSION BUS CONNECTORS

This section describes the PC/104, ISA and PCI bus connectors.

PC/104 bus boards plug into J1 and J2, or to J34 and J35. These PC/104 bus connectors carry the ISA bus compatible signals to the rest of the TCDEVPLUS, including to the ISA bus edge connector J32. PC/104-Plus boards plug into the J1, J2 and J3 connectors. J3 is the PC/104-Plus connector, which carries the PCI compatible signals to the standard PCI edge connector, J33.

Note that not all processors make use of all signals. In the case of the GCAT486 some ISA bus signals have alternative functions. Refer to the Technical Reference Manual of the processor you are using for details.

As noted in section 3.3, the power supply rails to the PC/104 and GCAT486 boards are isolated from the rest of the TCDEVPLUS, to allow power consumption of the boards to be measured. Accordingly, the power supply pins on J1, J2, J3, J34 and J35 are named "BVCC" to distinguish this power rail from the main VCC power rail. This also applies to the I/O connectors J4 and J5.

E.4.1 J1 and J34 PC/104 Bus Connectors

Pin 1 of J1and J34 connector are marked on the PCB silk-screen with a "1", and rows A and B are also marked.

PIN	ROW A	ROW B
1	/IOCHCHK	0V
2	SD7	RESETDRV
3	SD6	BVCC
4	SD5	IRQ9
5	SD4	N/C
6	SD3	DREQ2
7	SD2	-12V
8	SD1	/ZEROWS
9	SD0	+12V
10	IOCHRDY	GND
11	AEN	/SMEMW
12	SA19	/SMEMR
13	SA18	/IOWR
14	SA17	/IORD
15	SA16	/DACK3
16	SA15	DREQ3
17	SA14	/DACK1
18	SA13	DREQ1
19	SA12	/REFRESH
20	SA11	BUSCLK
21	SA10	IRQ7
22	SA9	IRQ6
23	SA8	IRQ5
24	SA7	IRQ4
25	SA6	IRQ3
26	SA5	/DACK2
27	SA4	TC
28	SA3	ALE
29	SA2	BVCC
30	SA1	OSC
31	SA0	0V
32	0V	0V

TABLE E16 - PC/104 J1 & J34 PIN ASSIGNMENTS

E.4.2 J2 and J35 PC/104 Bus Connectors

Note that J2 and J35 number from pin 0, not pin 1. Pins 0 and 19 of J2 and J35 connector are marked on the PCB silk-screen with a "0" and "19" respectively, and rows C and D are also marked.

PIN	ROW C	ROW D
0	0V	0V
1	/SBHE	/MEMCS16
2	LA23	/IOCS16
3	LA22	IRQ10
4	LA21	IRQ11
5	LA20	IRQ12
6	LA19	IRQ15
7	LA18	IRQ14
8	LA17	/DACK0
9	/MEMR	DREQ0
10	/MEMW	/DACK5
11	SD8	DREQ5
12	SD9	/DACK6
13	SD10	DREQ6
14	SD11	/DACK7
15	SD12	DREQ7
16	SD13	BVCC
17	SD14	N/C
18	SD15	0V
19	N/C	0V

TABLE E17 - PC/104 J2 AND J35 PIN ASSIGNMENTS

E.4.3 J3 PC/104-Plus Bus Connector

Pin positions 1 and 30 are indicated on the PCB as are the row positions "A", "B", "C" and "D".

The 120-way PC/104-Plus bus connector takes PCI bus signals to the PCI bus edge connector J33, thus allowing PC/104-Plus processors to drive PCI bus I/O boards. The PCI bus connector is wired as slot B. Therefore it is connected to CLK1, REQ1#, ACK1# and IDSEL1. The interrupts are rotated one position, so PCI slot INTA# drives PC/104-Plus INTB# pin.

The PC/104-Plus connector may have a VI/O voltage of either 5V or 3.3V. VI/O is sourced from the PC/104-Plus card to the PCI bus edge connector. As standard the TCDEVPLUS is fitted with a 5V PCI bus edge connector. This means that 5V PCI

bus cards cannot be used with PC/104-Plus processors with a 3.3V VI/O, such as the TP400.

The 3.3V power supply on the PCI bus edge connector is also sourced from the PC/104-Plus board. These power pins are referred to as P3V3 in these tables.

PIN	J3 ROW A	J3 ROW B	J3 ROW C	J3 ROW D
1	GND(5V KEY)	N/C	BVCC	AD0
2	VI/O	AD2	AD1	BVCC
3	AD5	GND	AD4	AD3
4	C/BE0#	AD7	GND	AD6
5	GND	AD9	AD8	GND
6	AD11	VI/O	AD10	N/C
7	AD14	AD13	GND	AD12
8	P3V3	C/BE1#	AD15	P3V3
9	SERR#	GND	SB0#	PAR
10	GND	PERR#	P3V3	SDONE
11	STOP#	P3V3	LOCK#	GND
12	P3V3	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	P3V3
14	GND	AD16	P3V3	C/BE2#
15	AD18	P3V3	AD17	GND
16	AD21	AD20	GND	AD19
17	P3V3	AD23	AD22	P3V3
18	N/C	GND	IDSEL1	N/C
19	AD24	C/BE3#	V/IO	N/C
20	GND	AD26	AD25	GND
21	AD29	BVCC	AD28	AD27
22	BVCC	AD30	GND	AD31
23	N/C	GND	REQ1#	VI/O
24	GND	N/C	BVCC	N/C
25	GNT1#	VI/O	N/C	GND
26	BVCC	N/C	GND	CLK1
27	N/C	BVCC	N/C	GND
28	GND	INTD#	BVCC	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	N/C	N/C	GND(3V3 KEY)

TABLE E18 - PC/104-PLUS BUS CONNECTOR PIN ASSIGNMENTS

E.4.4 J33 PCI Bus Edge Connector

Connector J33 is a 120 Way PCI bus edge connector. See the notes for the J3 connector for details of connections to this connector.

Pin positions A1 and A61 are indicated on the PCB.

PIN	ROW A	ROWB	PIN	ROWA	ROW B
1	N/C	-12	2	+12V	N/C
3	N/C	GND	4	N/C	N/C
5	VCC	VCC	6	INTB#	VCC
7	INTD#	INTC#	8	VCC	INTA#
9	N/C	N/C	10	VIO	N/C
11	N/C	N/C	12	GND	GND
13	GND	GND	14	N/C	N/C
15	RST#	GND	16	VIO	CLK1
17	GNTI#	GND	18	GND	REQ1#
19	/PME	VIO	20	AD30	AD31
21	P3V3	AD29	22	AD28	GND
23	AD26	AD27	24	GND	AD25
25	AD24	P3V3	26	IDSEL1	C/BE3#
27	P3V3	AD23	28	AD22	GND
29	AD20	AD21	30	GND	AD19
31	AD18	P3V3	32	AD16	AD17
33	P3V3	C/BE2#	34	FRAME#	GND
35	GND	IRDY#	36	TRDY#	P3V3
37	GND	DEVSEL#	38	STOP#	GND
39	P3V3	LOCK#	40	SDONE	PERR#
41	SB0#	P3V3	42	GND	SERR#
43	PAR	P3V3	45	P3V3	AD14
45	P3V3	AD14	46	AD13	GND
47	AD11	AD12	48	GND	AD10
49	AD9	GND	(50)	No pin	No pin
(51)	No pin	No Pin	52	/CBE0#	AD8
53	P3V3	AD7	54	AD6	P3V3
55	AD4	AD5	56	GND	AD3
57	AD2	GND	58	AD0	AD1
59	VIO	VIO	60	N/C	N/C
61	VCC	VCC	62	VCC	VCC

TABLE E19 - J33 PCI CONNECTOR PIN ASSIGNMENTS

E.4.5 J32 PC/AT Edge Connector

Connector J32 is a PC/AT ISA bus edge connector. Pins A1, B1, C1 and D1 are marked on the PCB.

PIN	ROW A	ROW B	ROW C	ROW D
1	/IOCHCHK	GND	/SBHE	/MEMCS16
2	SD7	RESETDRV	LA23	/IOCS16
3	SD6	VCC	LA22	IRQ10
4	SD5	IRQ9	LA21	IRQ11
5	SD4	N/C	LA20	IRQ12
6	SD3	DREQ2	LA19	IRQ15
7	SD2	-12V	LA18	IRQ14
8	SD1	/ZEROWS	LA17	/DACK0
9	SD0	+12V	/MEMR	DREQ0
10	IOCHRDY	GND	/MEMW	/DACK5
11	AEN	/SMEMW	SD8	DREQ5
12	SA19	/SMEMR	SD9	/DACK6
13	SA18	/IOWR	SD10	DREQ6
14	SA17	/IORD	SD11	/DACK7
15	SA16	/DACK3	SD12	DREQ7
16	SA15	DREQ3	SD13	VCC
17	SA14	/DACK1	SD14	N/C
18	SA13	DREQ1	SD15	GND
19	SA12	/REFRESH		
20	SA11	BUSCLK		
21	SA10	IRQ7		
22	SA9	IRQ6		
23	SA8	IRQ5		
24	SA7	IRQ4		
25	SA6	IRQ3		
26	SA5	/DACK2		
27	SA4	TC		
28	SA3	ALE		
29	SA2	VCC		
30	SA1	OSC		
31	SA0	GND		

TABLE E20 - J32 PC/AT CONNECTOR PIN ASSIGNMENTS

E.5 I/O Connectors

This section describes the connectors which take I/O signals between the processor boards and the TCDEVPLUS. These are the 50-way connector J4, the 14-way connector J5 and the four 100-way GCAT486 connectors J36 – J39

As noted in section 3.3, the power supply rails to the PC/104 and GCAT486 boards are isolated from the rest of the TCDEVPLUS, to allow power consumption of the boards to be measured. Accordingly, the power supply pins on the I/O connectors are named "BVCC" and "B3V3" to distinguish these power rails from the main VCC and 3.3V power rails. This also applies to the PC/104 and PC/104-Plus connectors.

E.5.1 J4 50-Way I/O Connector

This 50-way connector is found on all of DSP Design's processor boards. Pins 1 and 2 are power supply pins on the early TC386 and TC486 boards. Pins 1 and 2 are marked on the PCB. **Potential problems can arise when using the old TC386 and TC486 processor boards with the TCDEVPLUS. Users should refer to Appendix B (description of jumper E10) before using these boards.**

PIN	SIGNAL	PERIPHERAL	PIN	SIGNAL	PERIPHERAL
1	IRRX	IrDA	2	IRTX	IrDA
3	MCLOCK	MOUSE	4	MDATA	MOUSE
5	SLCT	PRINTER	6	PE	PRINTER
7	BUSY	PRINTER	8	/ACK	PRINTER
9	PD7	PRINTER	10	PD6	PRINTER
11	PD5	PRINTER	12	PD4	PRINTER
13	GND	PRINTER	14	PD3	PRINTER
15	/SLCTIN	PRINTER	16	PD2	PRINTER
17	/INIT	PRINTER	18	PD1	PRINTER
19	/ERROR	PRINTER	20	PD0	PRINTER
21	/AUTOFD	PRINTER	22	/STROBE	PRINTER
23	GND	RESET SW	24	/RESET	RESET SW
25	BVCC	SPEAKER	26	SPKR	SPEAKER
27	GND	BATTERY	28	BATT	BATTERY
29	BVCC	KEYBOARD	30	/KBDATA	KEYBOARD
31	GND	KEYBOARD	32	/KBCLK	KEYBOARD
33	GND	COM2	34	RI2	COM2
35	DTR2	COM2	36	CTS2	COM2
37	TXD2	COM2	38	RTS2	COM2
39	RXD2	COM2	40	DSR2	COM2
41	DCD2	COM2	42	GND	COM1
43	RI1	COM1	44	DTR1	COM1
45	CTS1	COM1	46	TXD1	COM1
47	RTS1	COM1	48	RXD1	COM1
49	DSR1	COM1	50	DCD1	COM1

TABLE E21 - J4 I/O CONNECTOR PIN ASSIGNMENTS

E.5.2 J5 14-Way I/O Connector

This connector is found on some but not all of DSP Design's processor boards. On some boards only the middle ten pins are present. This means that care must be taken when plugging in the 14-way ribbon cable to the 10-way processor board connector. In this case, ensure that there are two unused pins at either end of the 14-way socket; pin 1 of the processor connector goes to pin 3 of the ribbon cable.

Pins 13 and 14 are TTL level COM4 transmit and receive data signals. They are connected to pins 17 and 18 respectively of the Miscellaneous connector, J25.

Pins 1 and 14 are marked on the PCB.

PIN	SIGNAL	PERIPHERAL	PIN	SIGNAL	PERIPHERAL
1	/DISFLASH		2	/PME	
3	GND	COM3	4	RI3	COM3
5	DTR3	COM3	6	CTS3	COM3
7	TXD3	COM3	8	RTS3	COM3
9	RXD3	COM3	10	DSR3	COM3
11	DCD3	COM3	12	BVCC	COM3
13	/TxD4	COM4	14	/RxD4	COM4

TABLE E22 - J5 CONNECTOR PIN ASSIGNMENTS

E.5.3 J36, J37, J38 and J39 100-Way Inter-Board Connectors

All of the GCAT486 signals are accessible through two 100-way connectors. These are used to interconnect a GCAT486 with a GCAT486P2 PC Card adapter board or with the customer's own motherboard. They can also be used to allow access to GCAT486 peripheral signals and ISA bus signals. J36 and J37 have the same pin assignments but are the opposite polarity. J38 and J39 have the same pin assignments but are the opposite polarity.

Pins marked with an asterisk (*) have multiple functions. For the most part, the names given here indicate the default functions. See GCAT486 Technical reference Manual for details of their alternative functions.

Pins 1, 50, 51 and 100 are indicated on the PCB.

PIN	SIGNAL	PERIPHERAL	PIN	SIGNAL	PERIPHERAL
1	ADCGND	A/D Converter	51	ADC1	A/D Converter
2	ADC0	A/D Converter	52	ADCGND	A/D Converter
3	ADCGND	A/D Converter	53	ADC3	A/D Converter
4	ADC2	A/D Converter	54	ADCGND	A/D Converter
5	ADCGND	A/D Converter	55	VREF	A/D Converter
6	VIRDA	IrDA	56	ADCGND	A/D Converter
7	B3V3	Power	57	SIROUT	IrDA
8	SA21	ISA Bus	58	GD0	ISA Bus
9	GND	Power	59	GD4	ISA Bus
10	SIRIN	IrDA	60	GD8	ISA Bus
11	B3V3	Power	61	GD6	ISA Bus
12	RTS1	COM1	62	GD3	ISA Bus
13	GD1	ISA Bus	63	GD5	ISA Bus
14	GD2	ISA Bus	64	DSR1	COM1
15	GND	Power	65	GD7	ISA Bus
16	TXD1	COM1	66	GD10	ISA Bus
17	CTS1	COM1	67	DCD1	COM1
18	RXD1	COM1	68	GD9	ISA Bus
19	PIRQ0 *	ISA Bus	69	B3V3	Power
20	DTR1	COM1	70	RI1	COM1
21	DCD2	COM2	71	GD11	ISA Bus
22	GND	Power	72	GD12	ISA Bus
23	GA22	ISA Bus	73	GD13	ISA Bus
24	SA0	ISA Bus	74	/PCMWE	PC Card
25	SA1	ISA Bus	75	GD14	ISA Bus
26	RXD2	COM2	76	/REG_A	PC Card
27	SA2	ISA Bus	77	RDY_A	PC Card
28	GND	Power	78	/PCMOE	PC Card
29	TXD2	COM2	79	/CD_A	PC Card
30	DSR2	COM2	80	B3V3	Power
31	B3V3	Power	81	RST_A	PC Card
32	DTR2	COM2	82	B3V3	Power
33	RTS2	COM2	83	BVD2_A	PC Card
34	GND	Power	84	WP_A	PC Card
35	CTS2	COM2	85	B3V3	Power
36	/ROMRD	EPROM	86	/WAIT_AB	PC Card
37	RI2	COM2	87	SLCT *	Printer
38	/IORD	ISA Bus	88	GND	Power
39	DSR3	COM3	89	B3V3	Power
40	PIRQ1 *	ISA Bus	90	/STRB *	Printer
41	DCD3	COM3	91	BVD1_A	PC Card
42	RESETDRV	ISA Bus	92	/PPDWE *	Printer Control
43	/RESET	Reset Switch	93	GD15	ISA Bus
44	RXD3	COM3	94	/IOWR	ISA Bus
45	/ENFLASH	EPROM Control	95	ICDIR	PC Card
46	B3V3	Power	96	SA25	ISA Bus
47	TXD3	COM3	97	RTS3	COM3
48	GND	Power	98	CTS3	COM3
49	DTR3	COM3	99	RI3	COM3
50	/ROMCS0	EPROM	100	SPKR	Speaker

TABLE E23 - J36 AND J37 100-WAY INTER-BOARD CONNECTOR

PIN	SIGNAL	PERIPHERAL	PIN	SIGNAL	PERIPHERAL
1	VLCD	Graphics LCD	51	LP	Graphics LCD
2	GND	Graphics LCD	52	DOTCLK	Graphics LCD
3	VEE	Graphics LCD	53	/BL1	Power Management
4	FLM	Graphics LCD	54	VO	Graphics LCD
5	LCDD7	Graphics LCD	55	M	Graphics LCD
6	LCDD5	Graphics LCD	56	LCDD6	Graphics LCD
7	SA24	ISA Bus	57	LCDD4	Graphics LCD
8	LCDD3	Graphics LCD	58	LCDD2	Graphics LCD
9	LCDD1	Graphics LCD	59	LCDD0	Graphics LCD
10	SUS_RES	Suspend Switch	60	KBDROW13	Key Matrix
11	SA11	ISA Bus	61	/SBHE *	ISA Bus
12	SA13	ISA Bus	62	GND	Power
13	BATT	Battery	63	SA3	ISA Bus
14	BALE *	ISA Bus	64	PIRQ2 *	ISA Bus
15	SA16	ISA Bus	65	SA12	ISA Bus
16	PIRQ93 *	ISA Bus	66	/DACK 1*	ISA Bus
17	SA15	ISA Bus	67	KBDROW5	Key Matrix
18	PIRQ1 *	ISA Bus	68	SA7	ISA Bus
19	/MEMCS16 *	ISA Bus	69	SA8	ISA Bus
20	KBDROW6	Key Matrix	70	B3V3	Power
21	PIRQ7 *	ISA Bus	71	KBDROW1	Key Matrix
22	MA2	Boot Control	72	GND	Power
23	SA10	ISA Bus	73	SA5	ISA Bus
24	/ROMCS1	EPROM	74	KBDROW3	Key Matrix
25	KBDROW2	Key Matrix	75	GPIO_CS13 *	GPIO
26	GND	Power	76	SA6	ISA Bus
27	KBDROW0	Key Matrix	77	AEN *	ISA Bus
28	GPIO_16 *	GPIO	78	KBDCOL 7 *	Key Matrix
29	/ROMWR	EPROM	79	IOCHRDY *	ISA Bus
30	GND	Power	80	GPIO_15 *	GPIO
31	KBDROW4	Key Matrix	81	PIRQ6 *	ISA Bus
32	B3V3	Power	82	/IOCS16 *	ISA Bus
33	/MEMR	ISA Bus	83	TC *	ISA Bus
34	PIRQ5 *	ISA Bus	84	ATCLK	AT Keyboard
35	B3V3	Power	85	PIRQ4 *	ISA Bus
36	GPIO_CS14 *	GPIO	86	/DACK0 *	ISA Bus
37	SA23	ISA Bus	87	/XTCLK *	XT Keyboard
38	SA20	ISA Bus	88	PDRQ0 *	ISA Bus
39	SA18	ISA Bus	89	GPIO_17 *	GPIO
40	SA14	ISA Bus	90	GPIO_18 *	GPIO
41	SA19	ISA Bus	91	XDATA *	XT Keyboard
42	B3V3	Power	92	GND	Power
43	SA17	ISA Bus	93	/AFD *	Printer
44	SA9	ISA Bus	94	/INIT *	Printer
45	/MCEL_A	PC Card	95	/PPOEN *	Printer Port Control
46	/SLCTIN *	Printer	96	/ERROR *	Printer
47	SA4	ISA Bus	97	PE *	Printer
48	/MEMW	ISA Bus	98	/BL2	Power Management
49	GND	Power	99	BUSY *	Printer
50	/MCEH_A	PC Card	100	/ACK *	Printer

TABLE E24 - J38 AND J39 100-WAY INTER-BOARD CONNECTOR

E.6 LCD CONNECTIONS

The connectors in this group connect the GCAT486 to LCD panels.

E.6.1 J18 DMF50840 Display Connector

Connector J18 is a 14-pin Flat Flexible Cable connector with a 1.25mm pitch. Pin 1 is indicated on the PCB and on the connector

PIN	SIGNAL	PIN	SIGNAL
1	LCDD0	8	LP
2	LCDD1	9	DOTCLK
3	LCDD2	10	VLCD
4	LCDD3	11	GND
5	VLCD	12	VEE
6	FLM	13	VO
7	N/C	14	GND

TABLE E25 - J18 DISPLAY CONNECTOR PIN ASSIGNMENTS

E.6.2 J28 LMG7525 Display Connector

Connector J18 is a 12-pin Flat Flexible Cable connector with a 1.0mm pitch. Pin 1 and 12 are indicated on the PCB.

PIN	SIGNAL	PIN	SIGNAL
1	FLM	7	LCDD0
2	LP	8	LCDD1
3	DOTCLK	9	LCDD2
4	VLCD	10	LCDD3
5	GND	11	VLCD
6	VEE	12	N/C

TABLE E26 - J28 DISPLAY CONNECTOR PIN ASSIGNMENTS

E.6.3 J19 K3240 Display Connector

Connector J19 is a 20-pin Flat Flexible Cable connector with a 0.5mm pitch. Pin 1 and 20 are indicated on the PCB.

PIN	SIGNAL	PIN	SIGNAL
1	VLCD	11	LCDD7
2	GND	12	LCDD0
3	VLCD	13	LCDD1
4	FLM	14	LCDD2
5	N/C	15	LCDD3
6	LP	16	VR1
7	DOTCLK	17	VR2
8	LCDD4	18	VR3
9	LCDD5	19	N/C
10	LCDD6	20	N/C

TABLE E27 - J19 DISPLAY CONNECTOR PIN ASSIGNMENTS

E.6.4 J20 LM5Q32 Display Connector

Connector J20 is a 20-pin Flat Flexible Cable connector with a 0.8mm pitch. Pin 1 and 20 are indicated on the PCB.

PIN	SIGNAL	PIN	SIGNAL
1	FLM	11	LCDD4
2	LP	12	LCDD5
3	GND	13	LCDD6
4	DOTCLK	14	LCDD7
5	GND	15	LCDD0
6	N/C	16	LCDD1
7	VLCD	17	LCDD2
8	VLCD	18	LCDD3
9	VPOS	19	GND
10	GND	20	GND

TABLE E28 - J20 LCD PANEL CONNECTOR PIN ASSIGNMENTS

E.6.5 J22 Display Connector

To allow other LCDs to be connected the TCDEVPLUS contains a 20-pin 0.1" pitch pin header. A ribbon cable can be attached to this and this can then be wired to the new connector as required.

Pin 1, 2, 19 and 20 are indicated on the PCB.

PIN	SIGNAL	PIN	SIGNAL
1	FLM	2	LP
3	GND	4	DOTCLK
5	GND	6	M
7	VEE	8	VO
9	VLCD	10	GND
11	LCDD4	12	LCDD5
13	LCDD6	14	LCDD7
15	LCDD0	16	LCDD1
17	LCDD2	18	LCDD3
19	VPOS	20	GND

TABLE E29 - J22 LCD CONNECTOR PIN ASSIGNMENT

E.6.6 J31 Alphanumeric Display Connector

Connector J31 is provided to allow the connection of alphanumeric displays. These displays can be accessed by manipulating GPIO pins on the GCAT486. A sample program is provided with the GCAT486 showing how this is done.

Pin 1,2,15 and 16 are indicated on the PCB.

PIN	SIGNAL	DISPLAY SIGNAL	PIN	SIGNAL	DISPLAY SIGNAL
1	GND	GND	2	Power from LK1	VDD
3	CONTRAST from VR2	Vo	4	GPIO28	RS
5	GPIO29	R/W	6	GPIO30	E
7	N/C	DB0	8	N/C	DB1
9	N/C	DB2	10	N/C	DB3
11	GPIO24	DB4	12	GPIO25	DB5
13	GPIO26	DB6	14	GPIO27	DB7
15	Backlight (VCC through 100R)	LED+	16	GND	LED-

TABLE E30 - J31 ALPHANUMERIC LCD CONNECTOR

E.7 POWER CONNECTIONS

The connectors in this group are related to power supply. Power can be applied to the TCDEV through J23 or J24, but not both. If power is applied through J24 then J23 can be used to supply power to 3.5" disk drives, if you make up a suitable cable.

E.7.1 J23 PC Power Connector

Connector J23 is a 4-pin connector of the type used by hard disk drives.

Pin numbers of this connector are not marked on the PCB. Pin 1 (the +12V pin) is at the top of the PCB, near the "J23" text.

PIN	SIGNAL
1	+12V
2	GND
3	GND
4	VCC (+5V)

TABLE E31 - J23 PC POWER CONNECTOR PIN ASSIGNMENTS

E.7.2 J24 PC Power Connector

Connector J24 is a 6-Way-MOLEX connector. It mates with the TPPSU power supply from DSP Design. Note that these power connectors are polarized. Ensure that the locking tab on the power supply cable mates with the locking tab on the TCDEVPLUS connector. Pin 1 is indicated on the PCB.

PIN	SIGNAL
1	GND
2	GND
3	VCC (+5V)
4	VCC (+5V)
5	+12V
6	-12V

TABLE E32 - J24 POWER CONNECTOR PIN ASSIGNMENTS

E.7.3 J29 PSU Monitoring Connector

Connector J29 is a 10 Pin header connector. It is in fact a jumper area, rather than a connector, and has been mislabeled during the PCB design process. It is documented in Appendix B.

(This page is intentionally left blank)

APPENDIX F: REPROGRAMMING BIOSES

Most processor boards from DSP Design have a BIOS programmed into Flash memory. Sometimes during the development process users can carelessly erase this BIOS. Without the BIOS the processor is dead. Fortunately the TCDEVPLUS can be used to reprogram the BIOS.

F.1 GENERAL PRINCIPALS

The general principles are as follows.

1. The Flash memory chip on the processor board must be disabled. This is usually done by changing a solder link on the processor PCB.

2. A suitable BIOS must be programmed into an EPROM, and the EPROM installed in the TCDEVPLUS EPROM socket, and the EPROM address decoder jumpers correctly set. BIOS files are provided on the Utilities Disks for the processor boards.

3. The processor can then boot using the BIOS in the EPROM.

4. The Flash Programming program can then be run, to reprogram the processor board Flash chip with a new BIOS.

5. The BIOS image in the EPROM is disabled.

6. The BIOS image in the Flash memory on the processor card is re-enabled, by changing the solder link again.

Detailed instructions follow for some of DSP Design's processor boards. Refer also to corresponding sections of the processor's Technical Reference Manual and Utility Disks for further information, and up to date instructions.

The BIOS images that are called for in the sections below can be found on the TCDEVPLUS Utility Disk. These BIOS images are not guaranteed to be the most recent BIOS for each product, but they will be adequate for restoring a corrupt BIOS.

F.2 TB486

1. Disable the TB486 Flash memory by removing LK4.

2. The default BIOS shipped with the TCDEVPLUS contains a TB486 BIOS image, so there is no need to program an EPROM. Set all the E6 jumpers to the EN position. Enable the TCDEVPLUS VGA controller at E3 and use the VGA connector on the TCDEVPLUS.

3. Add a wire between TP1 test point on the TCDEVPLUS (below the XT/AT edge connector) and the TP1 test point on the TB486. Power on and allow the TB486 to boot from the BIOS in the EPROM.

4. Remove the TP1 wire lead. From a floppy disk run the TB486 Flash Programming Program, and program a suitable BIOS file into the Flash memory. See the README.TXT file in the BIOS directory of the TB486 Utility Disks to select a suitable BIOS. We suggest using the default BIOS. You reprogram the BIOS by typing this:

   TB4F016 –u<BIOS file name>

5. Power off the TCDEVPLUS and move all E6 jumpers to DIS except the C000 jumper which should be in the EN position to use the TCDEVPLUS on-board VGA controller.

6. Enable the TB486 Flash memory by adding a solder link at LK4.

F.3 TP300

1. Disable the TP300 Flash memory by removing LK16.

2. Program the TP300 BIOS into a 27C2001 EPROM. You will find this in the BIOS directory of the TP300 Utility Disks. Set all the E6 jumpers to the EN position. Disable the TCDEVPLUS VGA controller at E3 and connect a VGA monitor to the TP300 connector J6. (It is possible to work without a monitor – you may find it useful to use a batch file to program the BIOS.)

3. Power on and allow the TP300 to boot from the BIOS in the EPROM.

4. From a floppy disk run the TP300 Flash Programming Program, and program the BIOS file into the Flash memory. You reprogram the BIOS by typing this:

   TP3F016 –u<BIOS file name>

5. Power off the TCDEVPLUS and replace your EPROM with the standard TCDEVPLUS EPROM. Move all E6 jumpers to DIS except the C000 jumper which should be in the EN position to use the TCDEVPLUS on-board VGA controller. You will also need to enable the VGA controller at E3.

6. Enable the TP300 Flash memory by adding a solder link at LK16.

F.4 TP400

1. Disable the TP400 Flash memory by adding a solder link at LK16.

2. Program the TP400 BIOS into a 27C2001 EPROM. You will find this in the BIOS directory of the TP400 Utility Disks. Set all the E6 jumpers to the EN position. Disable the TCDEVPLUS VGA controller at E3 and connect a VGA monitor to the TP400 connector J6. (It is possible to work without a monitor – you may find it useful to use a batch file to program the BIOS.)

3. Power on and allow the TP400 to boot from the BIOS in the EPROM.

4. From a floppy disk run the TP400 Flash Programming Program, and program the BIOS file into the Flash memory. You reprogram the BIOS by typing this:

TP3F016 –u<BIOS file name>

5. Power off the TCDEVPLUS and replace your EPROM with the standard TCDEVPLUS EPROM. Move all E6 jumpers to DIS except the C000 jumper which should be in the EN position to use the TCDEVPLUS on-board VGA controller. You will also need to enable the VGA controller at E3.

6. Enable the TP400 Flash memory by removing the solder link at LK16.

F.5 TX486

1. Disable the TX486 Flash memory by removing LK9.

2. Program the default TX486 BIOS into a 27C1001 EPROM (or into the top half of a 27C2001 EPROM, at offset 20000h). See the README.TXT file in the BIOS directory of the TX486 Utility Disks to select the default BIOS. Set the four E6 jumpers marked E000, E800, F000 and F800 to the EN position and the other four to the DIS position. (Note that this BIOS image contains the VGA BIOS for the TCDEVPLUS VGA controller). Enable the TCDEVPLUS VGA controller at E3 and connect a VGA monitor to the TCDEVPLUS VGA connector.

3. Power on and allow the TX486 to boot from the BIOS in the EPROM. Enter Setup and disable the on-board floppy and on-board IDE controllers in the "Peripheral Setup" menu.

4. From a floppy disk run the TX486 Flash Programming Program, and program a suitable BIOS file into the Flash memory. See the README.TXT file in the BIOS directory of the TX486 Utility Disks to select a suitable BIOS. We suggest using the default BIOS. You reprogram the BIOS by typing this:

   TC5F016 –u<BIOS file name>

5. Power off the TCDEVPLUS and replace your EPROM with the standard TCDEVPLUS EPROM. Move all E6 jumpers to DIS. If you are not using a TX486 BIOS which already includes the VGA BIOS for the TCDEVPLUS VGA controller, then move the C000 jumper to the EN position, which allows you to use the TCDEVPLUS on-board VGA controller.

6. Enable the TX486 Flash memory by adding a solder link at LK9.

F.6 GCAT486

1. Disable the GCAT486 Flash memory by moving the solder link at LK8 to the 2 - 3 position.

2. Program a GCAT486 BIOS into the top half of a 27C2001 EPROM (at offset 20000h). See the README.TXT file in the BIOS directory of the GCAT486 Utility Disks to select a suitable BIOS. We suggest using the default BIOS. Program the TCDEVPLUS VGA BIOS into the start of the 27C2001 EPROM (at offset 0h). Set all the E6 jumpers to the EN position. Enable the TCDEVPLUS VGA controller at E3 and connect a VGA monitor to the TCDEVPLUS VGA connector.

3. Power on and allow the GCAT486 to boot from the BIOS in the EPROM.

4. From a floppy disk run the GCAT486 Flash Programming Program, and program the BIOS file into the Flash memory. You reprogram the BIOS by typing this:

   GC4LV106 –u<BIOS file name>

5. Power off the TCDEVPLUS and replace your EPROM with the standard TCDEVPLUS EPROM. Move all E6 jumpers to DIS except the C000 jumper which should be in the EN position to use the TCDEVPLUS on-board VGA controller. You will also need to enable the VGA controller at E3.

6. Enable the GCAT486 Flash memory by moving the solder link at LK8 to the 1 - 2 position.

APPENDIX G: DIFFERENCES BETWEEN REV B AND REV C

There are two versions of the TCDEVPLUS in the field – the REV B and the REV C PCBs. This manual covers both versions.

The two versions can be distinguished by the text near the serial number patch: REV B boards include the number 186201.B00 and REV C boards have the text 186201.C00. Also, and more easily, the battery on the REV B board is near the EPROM socket and on the REV C board is near the power supply connector. This Appendix describes the differences between the two versions.

G.1 IrDA TRANSCEIVER

The REV B board has a single jumper at E10, which must be removed when using the TC386 and TC486 boards. In addition a resistors must be removed when using these boards.

The REV C board has a two-link jumper at E10, which removes the need to remove the resistor.

See section 3.7 and Appendix B for further details.

G.2 TEST POINTS

Three more test points have been added to the REV C board (to assist with DSP Design testing), and some test points have been renamed. See section 3.9 for further details.

G.3 BATTERY

The battery has been repositioned and a decoupling capacitor added on the REV C board. This is intended to reduce the noise being coupled onto the BATT signal, which was causing corruption of CMOS SRAM on some TP300 and TP400 boards.

G.4 IDE /IOCS16

A new jumper (E12) has been added on the REV C PCB. This disconnects the /IOCS16 on the IDE drives from the PC/104 bus /IOCS16. This is required when you want to connect the IDE connector of a TP300 or TP400 to the IDE connectors on the TCDEVPLUS.

See section 2.2 and Appendix B for further details.

G.5 BUG FIXES – VGA AND /IORD

The REV C board removes a cut track and wire link fix associated with the VGA controller chip.

It also adds buffering on the ISA bus /IORD and /IOWR signals. Previously, heavy loading of the /IORD signal was resulting in glitches on the /IORD signal, which manifest itself in intermittent operation of the floppy disk controller.

G.6 ETHERNET

A voltage regulator and jumper (E13) have been added to the REV C PCB. This allows for proper operation of the Ethernet magnetics with the 10/100Base-T Ethernet controller used on the TP400.

See section 3.8 for further details.

G.7 PCI SOCKET

The REV C PCB has been redesigned to allow for a 3.3V-only PCI bus socket to be installed. See section 3.10.2 for further details.

APPENDIX H: FAULT REPORTING

DSP Design makes every effort to ship products and documentation which are completely free from faults, design errors and inconsistencies. Sometimes, however, problems do show up in the field. To help us put these right as quickly and efficiently as possible, we need as much information as possible from you, the user.

For this reason we have included here a "Product Fault Report" form. If you ever have cause to return a board for repair, or if you detect an error in the documentation, we would appreciate it if you could fill in the form on the next page, or a copy of it, and return the form to your supplier.

Prior to returning a faulty product, please check the following:

1. The board has been correctly configured for the intended application (see earlier appendix for board installation details).

2. The power supplies are providing correct voltage levels.

3. Cabling to the board is sound and connected correctly.

4. Other cards in the system are known to be correctly configured and functioning.

5. **PLEASE RETURN THE BOARD TO US IN EXACTLY THE SAME CONFIGURATION AS IT FAILED IN.**

Your help with this will enable us to sort out your problem more quickly. Thank you.

PRODUCT FAULT REPORT

CUSTOMER INFORMATION

COMPANY NAME:

INDIVIDUAL CONTACT:

PHONE NO:

PRODUCT INFORMATION

PRODUCT/DOCUMENT:

SERIAL NO:

DATE OF RETURN:

SYMPTOMS OBSERVED /DOCUMENTATION ERRORS (as applicable):

IN WHAT CONFIGURATION IS THE BOARD USUALLY USED? (WHAT OTHER BOARDS, WHAT SOFTWARE ETC.)?

FOR DSP DESIGN USE ONLY:

PRODUCT TEST REPORT:

DATE OF RECEIPT:

REPAIRED BY:

CHARGES TO BE INVOICED: £

DATE OF RETURN:

RETURNED BY: